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Refining Sugar by Electricity.

A new company claims to possess the secret of refining sugar by electricity. The samples seen show a sugar evidently made by an entirely different process than any known refinery uses. The enterprise thus far partakes of the mysterious, in that its secret is known only to the discoverer and his wife (a prudent woman, it appears), and in that a number of confiding stockholders have parted with sufficient money to equip an electrical refinery on the most liberal scale. Everything except the secret machinery, which is inclosed in a sort of burglar-proof safe on a large scale, is open for inspection, and facilities can be seen for filling 3,000 to 4,000 barrels of refined sugar per day, a capacity almost equal to the largest of our present refineries. It is said that in the course of a month or two we shall see cargoes of raw sugar dumped into a hopper, and after passing through the mysterious safe reappear in any required grade of dry refined sugars, and having lost in the process less than 1 per cent. of its crystallizable contents, the whole time required for refining being about two hours. The cost of producing sufficient electricity to accomplish the result is placed at a remarkably low figure, which, if realized, will greatly affect the whole sugar refining business. In this age of wonders it will not do to pooh-pooh at anything electricity is claimed to be capable of, and the sugar trade waits with anxious, not to say somewhat excited interest, says a recent sugar circular, the developments of the next few months. Its success would so cheapen sugar to the consumer that consumption would enormously increase, and we nearly all like a "little sugar in ours."

Cost of Gas and Electricity.

A firm in Brussels, which has substituted electricity for gas in its spinning mills has computed the relative cost of the rival illuminants for the years 1886 and 1887. The comparative statement is interesting and instructive. During the year 1886, when the firm used gas, the cost was as follows:

Three hundred and sixty burners, 123 liters each, at 18 centimes (3½ cents) per cubic meter, cost per hour 7 97 francs ($1 54), 857 hours per annum at $1 54	$1,319 78
Maintenance	116 64
Total	$1,436 42

The cost of electricity during the year 1887 was as follows:

Carbons, consumption per lamp per hour, equal 4.4 centimes (8½ mills), 36 lamps for 857 hours, 1,357 5 francs	$261 99
Interest and depreciation, 12 per cent upon 15,000 francs	347 40
Maintenance	64 18
Coal	48 70
Extra coal for warming building	38 96
Total	$761 23
Balance in favor of electricity	675 19

This is a comparative statement worthy the consideration of every establishment paying high rates for inferior gas.

A Receiver for the Excelsior Electric Company.

In the suit of Attorney-General Taber, on the complaint of Henry D. Fuller, who owns 2,500 shares of the Excelsior Electric Company's stock, and alleges that the affairs have been fraudulently managed, Judge Andrews has appointed William O. Judge receiver. This is a Brooklyn company, and Mr. Geo. D. Allen, general manager, and Mr. Hochhausen, electrician and superintendent, are made defendants.

THE NEW CLUB HOUSE OF THE ELECTRIC CLUB, 17 EAST TWENTY-SECOND STREET, N. Y.

*** Bobby—Clara was telling ma that she had a call from you through the telephone yesterday, Mr. Featherly. Featherly—Yes; and what did your sister say, Bobby? Bobby—She said it was the pleasantest call she ever had from you.

Copper from Scrap Iron.

A German named George A. Rue, employed as clerk in a factory at Pittsfield, Mass., claims to have discovered a process for the manufacture of copper "from acids and scrap iron." Boston capitalists have interested themselves and applied for a patent. It is said that "fine copper crystals can be manufactured for eight cents per pound, and those in the ring think they have a bonanza. How about the "philosopher's stone"?

—— The Electrical Accumulator and Lighting Company have now nearly one thousand lights running from their storage batteries in the city of Detroit, Mich.

NATIONAL ELECTRICAL HEADQUARTERS.

Formal Opening of New Electric Club House.

A Remarkable Gathering of Eminent Electrical Personages.

PROF. ROWLAND'S COMPREHENSIVE ADDRESS.

IT COVERS THE OLD AND THE NEW ELECTRICITY,

And Gives Merited Honor to Michael Faraday.

PORTRAITS OF PROMINENT OFFICIALS AND AN INTERESTING REPORT OF THE PROCEEDINGS.

It was a refreshing and unusual sight which was unfolded to the view of the "Looker on in Venice" last Tuesday evening when the Electric Club formally threw open the doors of its new house, and gave fraternal greeting to its members and welcome to a few invited guests. Truly refreshing and unusual in these days of soulless corporations, commercial throat-cutting and intense rivalry. There, gathered under one hospitable roof, with no thought but that of enjoying themselves and entertaining all the rest, were business and professional rivals of every description. Men grown gray over vanquished commercial problems; inventors prematurely gray from burning the midnight oil over many a will-o'-the-wisp, who yet had caught the fleeting gossamer of progress and woven it into a web of gold; men, again, to whom the bewildering mazes of complicated mechanisms are as plain as the noonday sun; men, again, there were, who have from years of toil and study realized that

> "A little learning is a dangerous thing;
> Drink deep, or taste not the Pierian spring,"

and have drunk it deeply, and more deeply, till they have uncovered the gems that lent the fascinating sparkle to the glistening waters and tasted of the soul satisfying sweets of true scientific knowledge, and have become teachers of men; men, there were, who have plodded through tons upon tons of legal lore, who came tired from the musty caverns of law to be brightened and cheered by the scintillations of science which were sure to flash among that brilliant assemblage; men, again, who know "the pen is mightier

than the sword" but still came with numbed fingers and tired brain to have them vivified by the wondrous electrical panacea; men of politics, men of journalism, men of culture, men of medicine and surgery, men of the army and navy. They were all gathered there, a brilliant throng, with smiling faces and cheerful hearts, doing their best to make the occasion memorable. And they succeeded, for with last Tuesday night's formal opening, the Electric Club has lost the down of youth and taken on the hirsute vigor of manhood, though its youth, it must be admitted, was sturdy and strong, and its infancy was free from blight or weakness.

There has been many a brilliant gathering of the devotees of science in the past history of this great city, but there never has been one like this. It was not an assembly of individuals learned in one or more branches of science, engineering, medicine, or law; it was not a political gathering, for no one had an axe to grind (though many had hatchets to bury for the nonce); it was the launching into mature life of the pioneer electric club of the world, and very brilliantly was the launch accomplished, in the presence of intellect, ingenuity, fortune, fame, and, over all, fraternity and good will. One could almost feel that Franklin himself was looking with satisfaction on the scene, and mentally blessing himself that he had had the courage of his convictions, and flung aloft the kite which was so full of potential and prescience of the wonders that were to come. And why not, since he launched that kite, if not "within a stone's throw," certainly—thanks to telephonic enterprise — within speaking distance of this great metropolis? And what an army of followers he has had since; but none of them more keenly than he could see

> "Books in the running brooks,
> Sermons in stones, and good in everything."

DESCRIPTION OF THE CLUB HOUSE.

Number 17 East Twenty-second street is a large house, brown stone front, with the typical New York high stoop, very modest, and quietly located, and externally indistinguishable from its neighbors, save by the elegant electrolier hanging in the vestibule, and the artistic flash of the word Electric at the transom. As the knowing one mounts the steps, he touches an electric "open sesame," and the door self-opens to his approach by the potent influence which pervades the premises. On entering the main hall, well lighted by the warm glow of 20 electric lamps, the tasteful little clerk's office stands at the left, presided over by a handsome young man, and at the right hand the rich portieres of the parlors. Passing in, a gorgeous scene unfolds. Large double parlors, richly carpeted, beautifully furnished, the ceilings appropriately frescoed with electric designs, the walls adorned with handsome mirrors, and in front of one of them a beautiful mounted statue of the Goddess of Electricity, holding aloft the light that blazes for all the world; the whole scene made bright and cheerful by two magnificent cut-glass electroliers, having each thirty 16 candle power lamps and a number of tasteful five-light brass brackets. The effect is truly fine, and enhanced by the numberless facets of thousands of crystal pendants showering their sparkling rays in all directions from the great electroliers. Back of the parlors is the dining-room, furnished with carved oak tables and chairs, handsome silver service and cut-glass, and lighted by a most unique, massive wrought-iron electrolier of sixteen lights, which looks as though it could only have been made by one of the celebrated armorers of the feudal days, and been laid away to blacken and take on the garb of antiquity. Besides this, the dining room has a number of three and four-light brackets, and at every table is a convenient push button. Next to the dining room is the butler's pantry, which has every convenience. At the center of the main hall a wide staircase mounts to the upper floors, and is surmounted by an arched dome roofed with colored glass, producing a fine effect. On the second floor, at the front, is the officers' room, fitted up with fine solid mahogany desks and furniture, and the portraits of the elective officers of the club for 1887-8 are grouped on the wall. In one corner is the latest improved cabinet telephone set, finished in mahogany, and intended for long-distance telephoning, and on the opening night numerous conversations were held by gentlemen of the club with friends in Boston, Philadelphia, Albany and other distant points. This room is very tastefully lighted.

HENRY C. DAVIS, PRESIDENT OF THE ELECTRIC CLUB.

Occupying the front, beside the officers' room, is the library. This room is particularly well lighted, having in all twenty 16 candle power lights. There is a collection of electrical and scientific works and periodicals, and the club expects ere long to have the best library of this nature in the country. A number of portraits of prominent electrical men adorn the walls of the library, a large painting of Mr. Thomas A. Edison being among the number. It is proposed to make this a most complete reference library on

GEO. W. HEBARD, VICE-PRESIDENT.

electrical subjects. The remainder of the second floor is taken up by the large assembly or lecture room. This is arranged with forty Edison lamps judiciously distributed, and has a lecture platform and overhead sounding board at one end, at which special switchboards will deliver to the lecturer various E. M. Fs., with which to illustrate his subject when desired. This room will seat comfortably about 150 people. Two groups of 12 lights each are arranged close to the ceiling with diffusion reflectors, which give a splendid illumination to the room.

The floors above are fitted up for the accommodation of members who desire to remain over night at the club house, and will prove a favorite lodging place for out of town members when visiting the city. There will be accommodation for ten persons in this way, with all the conveniences of a first class hotel, and the certainty of meeting friends and kindred spirits.

The ground floor is devoted to a large billiard and pool room, toilet room with hot and cold water, boot-blacking and coat room, and kitchen and buffet in the rear.

The basement is completely given over to the power and light plant. This consists of a 75 horse power Babcock & Wilcox boiler, with duplicate pumps and a Goubert "Water Tube" heater; a 10x12 N. Y. S. S. P. Co.'s automatic engine, driving from an extension of its main shaft, two large dynamos; a 110 volt 200 light Thomson-Houston, and a 110 volt 250 light United States, the former driven by Ireson's link-leather belt, the U. S. by the Underwood patent cotton leather belt. But these do not represent the entire capacity, as there is besides a large battery of Electrical Accumulator Company's cells, consisting of 112 of their "15 A" size cells, arranged in two parallels of 50 each, with 10 regulating spare cells, and corresponding switchboards. As these cells have a normal discharge capacity of 35 amperes, the 70 amperes thus available will, when required, increase the total capacity of the plant to nearly 600 16 candle power lights. The standard of E.M.F. for the lamps is 106 volts.

The two parlor electroliers have the United States lamps, and all other fixtures have Sawyer-Man and Edison lamps.

A great portion of the entire outfit of the house has been generously given the club with good wishes by the manufacturers.

FORMAL CEREMONIES OF THE OPENING.

We do not know if the genial host of the evening, President Davis, was born "with a silver spoon in his mouth," but we do know that he must have been born with the presidency of this club in his mind's eye, for not otherwise could he have been so perfectly fitted to the position. His gratification showed itself in the irrepressible twinkle of his eye as he, at 8.30, called to order the three hundred and odd members and guests in the large parlors on the first floor, announced the Electric Club House formally open, and bade a hearty welcome to all. When, finally, silence was restored after this, and the electromotive force of the president's gavel had overcome the resistance of the pending Babel, the current of attention was directed towards the orator of the evening, whom Mr. Davis introduced in the person of Prof. H. A. Rowland, of Johns Hopkins University.

In his opening remarks President Davis said:

PRESIDENT DAVIS' ADDRESS.

Gentlemen and Fellow Members of the Electric Club:

On behalf of the Board of Managers, I extend to you a cordial welcome to our new house.

Meeting here this evening, to celebrate the opening of our club house, let us not feel that our work is accomplished, but that rather we are on the threshold of a long life of usefulness, and are laying the foundations of an institution that will be known and felt in electrical circles the world over, long after we, as individuals, are forgotten.

The social element that pervades a club house is one to encourage; regardless of our differences, we meet here on common ground, with a common object, and learn to know each other better; let us foster this element, and in expressing our opinions, let us be as free to accord that respect to the opinions of our fellow members that we demand for our own.

The social element is but a means to the end. We have a work, worthy of our highest ambitions, to accomplish. The progress of electrical science, and its rapidly increasing application to the commercial interests of the world, demand an organization that, while fostering the social element, will also furnish technical, scientific and educational advantages—an institution that will give the facilities of the museum, laboratory, library and lecture room; the museum with its mile stones of progress, that should be carefully guarded and handed down to posterity; the laboratory, with its corps of investigators, not to report this as better than that, but one capable of giving results, which will be accepted as authority; the library and lecture room, for those thirsting for a higher plane of intelligence.

Let our ambition be to lay such a foundation, for those who come after us to build upon. Let the Electric Club be to electrical matters what the Cooper and American Institutes of this city, and the Franklin Institute of Philadelphia, are to mechanical.

Through our united efforts, and the support we are sure to receive from the public-spirited citizens of New York, whose aim is to make this great city the center of all that is good and wise, this can be accomplished.

At the proper time, and with your assistance, I shall appoint such committees as may be necessary for its fulfillment, and I ask for your earnest and hearty co-operation; what we have accomplished in the short period of our existence encourages us to hope for the future.

THEY ALL WISHED TO BE THERE.

Mr. J. C. Tomlinson, chairman of the Entertainment Committee, read a number of letters of regret, among them from President Cleveland, Governor Hill, General Sherman, Lieut.-Gen. Sheridan, Admiral Porter Hon. John J. Ingalls, Hon. Frank Hiscock, Hon. Amos J. Cummings, Prof. C. A. Young, of Princeton, Prof. Chas. R. Cross, of Massa-

chusetts Institute of Technology. Admiral Porter concluded his letter as follows :

"Believe me, I take great interest in a club like yours, devoted to scientific pursuits, but my duties and engagements are of such a nature that I find myself unable, just now, to leave the Capital. Wishing you a most pleasant evening, I have the honor to remain very respectfully, your obedient servant,

DAVID D. PORTER,
Admiral."

Senator Ingalls regretted that public and social duties kept him in Washington, and said: "I am deeply interested in the work in which you are engaged."

General Sherman regretted "that numerous engagements, amongst them many to different clubs, about this time, compelled him to decline."

Senator Hiscock sent earnest wishes for the club's continued success.

Sir Wm. Thomson sent from England earnest wishes for the prosperity of the club, and his regrets at being unable to hear his friend, Prof. Rowland.

President Davis then introduced the speaker in the following words :

"I have the honor, gentlemen, to introduce to you, as the orator of the evening, Prof. H. A. Rowland, of Johns Hopkins University, of Baltimore."

PROF. ROWLAND'S ADDRESS ON "THE ELECTRICAL AND MAGNETIC DISCOVERIES OF FARADAY."

In the progress of all sciences there are epochs when men, thoroughly fitted by nature, if not by education also, for the most successful study and advancement of their science, are born into the world, and by their natural talent, perseverance and love of their science, give it an impetus which stamps their name forever on its history. But, however great they may be, we know enough of the nature of scientific progress to be sure that there never was one of such greatness as to be absolutely necessary to human progress. The world would never have stood still on account of the absence of any name from its annals, and even the place of the immortal Newton would sooner or later have been filled by others, and all the discoveries of his "principia" have been known to us now, even had he never existed.

Discoveries, then, have their origin not only in the presence of men of exceptional genius in the world, but in a true and overwhelming progress of science which marches forward to the understanding of the universe, irrespective of the efforts of any single individual to promote or retard it. It is a great fact, whose explanation we find in the craving of mankind for knowledge of nature and power over her.

As men of genius are born, they find the discoveries of those who have gone before them awaiting them. They join in the good work, and add their efforts toward the advancement of knowledge. But in all cases they start at the point where those who have gone before them have left off; if their work is good they continue it; if it is bad they replace it by better, that the structure of science may be reared on solid foundations, and grow surely and steadily toward a perfect whole.

To understand, then, the place of any man like Faraday in the history of science, we must also understand the state of that science at the time when he did his work

Michael Faraday, the son of a smith, was born in 1791, and was apprenticed to a bookseller and bookbinder in 1804. He educated himself by reading, and became the assistant of the great chemist, Sir Humphrey Davy when he was twenty-two years old. His attention was first given to chemistry, but was finally attracted to electricity by the discovery of electro-magnetism by Oersted, in 1820. At this period the subject of electrostatics was very far advanced even as compared with modern times.

More than 200 years before, Gilbert had commenced the study of electricity, and divided bodies into electrics and non-electrics, according as they produced or did not produce electricity by friction. Nearly 100 years before, Stephen Grey had discovered the difference between conductors and non-conductors, and had shown the means of carrying electrical effects to a distance of several hundred feet by means of a conducting thread or wire suspended by non-conducting threads of silk. Otto Von Guericke, Dubaye and White had shown that there were two kinds of electricity—resinous and vitreous. The Leyden jar had been discovered by the Dutch philosophers. Franklin had written his celebrated series of letters on electricity, explaining the phenomenon of the Leyden jar and induction as clearly as we can do it at present, giving his theory of positive and negative electricity to the world, and demonstrating in the most perfect manner the electrical nature of thunder and lightning.

Aepinus and Cavendish had applied mathematics to the subject, and the latter had discovered the law of inverse squares, and made for himself a series of graduated condensers, by which he measured the capacity of differently shaped bodies. They had been followed by La Place, Poisson and Biot in mathematical electricity. Coulomb had introduced his torsion balance, the first accurate instrument for electrical measurement.

Galvani and Volta had shown how to produce a current of electricity by the galvanic battery. The chemical action of electricity had long been known, and had been forcibly brought before the world by the immortal experiments of Davy only a short time before, and Ritter had discovered polarization and the storage battery.

THOS. A. EDISON, VICE-PRESIDENT OF THE ELECTRIC CLUB.

But, although many persons had suspected that there was some connection between electricity and magnetism it was not until Oersted, in 1820, discovered the nature of this connection, and Ampere had given the laws of the attraction of currents, that the science of electro-magnetism became a subject of investigation. This new discovery aroused the attention of the scientific world to another field of research, and especially awakened in Faraday that sublime curiosity with respect to its laws, which finally led him to his first discovery in this subject.

The new fact of electro-magnetism interested him. Soon he found that the turning of the needle, as found by Oersted, could be accounted for by the attempt of the north pole to revolve around the wire in one direction and the south pole in the other. Not content with demonstrating the theory, he invented some pieces of apparatus by which this revolution could be realized and every collection of physical apparatus now has them. The little wires or magnets hanging in the cups of mercury are familiar to all, and form the first notable instance of a continuous rotary motion produced by the electric current; it was the first form of electro-magnetic motor so common in our day. But we cannot call this a great discovery, as the principles were very apparent.

Eight or nine years now passed before Faraday gave anything of importance to the world in the subject of electricity and magnetism.

Seebeck discovered thermo-electricity. Ohm discovered the law connecting electromotive force, resistance and current, and the whole scientific world was alert to discover new facts. Faraday brooded on the subject: the electric current produced magnetism, why should not magnetism produce an electric current? At the present age of the world we could answer this question at once, by aid of the great law of the conservation of energy. But fifty-seven years ago it was unknown, except in a very vague manner; the foreshadowing of this great law soon came into the mind of Faraday, but at this period he could only grope blindly in the dark. He knew that a piece of soft iron became magnetic in the presence of a magnet, and that a conductor was electrified by induction when near a charged body. Reasoning by analogy, why should not a conducting circuit have a current generated in it in the presence of a wire carrying a current? This was Faraday's reasoning, and he proceeded to test it by experiment. Winding two wires side by side, on a cylinder of wood, he passed strong currents of electricity through one of them, and attached the other at its two ends to a galvanometer. The slightest permanent deflection was observed, and many a man would have pronounced the experiment a failure. But Faraday was not of that nature; he tried again and again, and while bending over the galvanometer in the vain effort to see a slight permanent deflection, he noticed a little jerk of the needle, almost too small to be noticed. His attention was arrested by this curious action, and he proceeded to investigate it.

JOHN B. POWELL, VICE-PRESIDENT.

He found that this slight movement of the needle was in one direction on making the current, and the opposite direction on breaking it. He substituted a helix, enclosing an unmagnetized needle for the galvanometer, and he found that it was magnetized by this electrical wave, at the moment of making or breaking the main current.

But Faraday was not contented until he had discovered all the laws of this new action; he placed two wires on boards, so that, when near together, they were parallel to each other. He now found that the action took place, not only when the current was interrupted, but also when one wire was moved with respect to the other.

So far, the new effect had only been obtained near an electric current. But Faraday did not forget the connection between electricity and magnetism, but now proceeded to give a new aspect to his discovery.

For this purpose he chose a ring of wrought iron on which he wound two coils of wire which he attached to a battery, and to a galvanometer, as before. From the presence of the iron, however, he obtained an immensely greater effect than at first, so that, instead of an almost microscopical deflection, the needle of the galvanometer whirled round three or four times, and on attaching two points of charcoal to the ends of the secondary wire, he observed a minute spark between them on completing the main current. The same increased effects occurred on placing bars of iron in straight coils of wire, and Faraday had now proved that the new effect was dependent on the magnetic action of the current.

He now made one step further, and showed that these induced currents could be obtained from permanent magnets without the aid of other currents, by the simple motion of a wire near a magnet, and that they were specially intense when the wire was wound on a soft iron cylinder, which was then moved near the poles of a magnet. Not content with observing these currents by a galvanometer, he obtained a powerful permanent magnet and allowed his bar of iron, wound with the coil, to come in contact with the poles, the circuit being broken at the same instant. A spark was observed at this broken junction every time the bar came down on the poles. Tyndal tells a curious story of this experiment which we can well recall. Faraday was attending a meeting of the British Association in Oxford, in 1832, and was requested to show some of his wonderful results to the scientists there gathered. While he was thus occupied a dignitary of the University entered and inquired what was going on. Prof. Daniell, who was standing near, explained the matter in popular language. The Dean listened with attention, and looked earnestly at the brilliant spark, but a moment afterwards he assumed a serious countenance, and shook his head: "I am sorry for it," said he, as he walked away; "I am sorry for it; indeed I am sorry for it; it is putting new arms into the hands of the incendiary." This occurred a short time after the papers had been filled with the doings of the hayrick burners.

Now, after more than fifty years, the spark of Faraday blazes at every street corner, but it has never been found more efficient than an ordinary lucifer match in the burning of hayricks.

Faraday's attention was now called to the explanation of a curious action discovered by Arago, who found that a rotating disk of copper carried a magnetic needle with it when the latter was suspended over it. The explanation had never been obtained, but Faraday now saw that it was but an instance of his newly discovered action. In order to show that currents were induced in the revolving plate, he mounted it between the poles of a magnet and connected the center with one pole of a galvanometer; on pressing a wire from the other pole to the edge, Faraday obtained a continuous current of electricity. This was the first continuous current dynamo ever constructed.

But he rested not until he had obtained the laws of induced currents and expressed them in such simple language that they have ever since been the admiration of the scientific world.

In giving the law of the production of these induced currents, Faraday for the first time made use of his famous "lines of force," although he here calls them magnetic curves.

He showed that a wire must cut these lines in order to have a current induced in it. In order to account for the induction in neighboring wires on making and breaking an electric current, he pictured in his mind the lines of force moving. The current could only start gradually after contact was made,

and while it was increasing the lines of force always closed on themselves in rings, were expanding outwards cutting any wires near it, and inducing currents in them. When the current was broken, the lines contracted and produced contrary induced currents.

In after years he made his law quantitative, and proved that the integral induced current was in proportion to the number of lines of force cut by the wire.

In his papers of 1831-2 I find these lines always called magnetic curves, and his laws of induced currents are given in terms of these curves. This idea of lines of force was ever after one of the principal points around which the mind of Faraday revolved. He applied it to electrical action as well as to magnetic, and we see him in after years striving to do away with action at a distance, and substitute for it a medium filled with these lines of force.

The medium subjected to electrical or magnetic forces is, according to Faraday's idea, polarized in the direction of these lines of force, so that each particle only has to act upon the one next to it in order that the force may be transmitted to any distance. In Faraday's mind these lines had not only an imaginary existence as being the direction in which the north pole of a needle or an electrified particle tended to move in space, but also a real existence. He imagined them as elastic bands repelling each other laterally, and binding the north and south poles of a magnet, or the positive and negative electricities, together.

It was only in after years that he discovered all the properties of these lines, and I shall therefore return to them again.

Guided by these lines of force, he investigated the subject of induced electric currents in so complete a manner that nothing of fundamental importance has ever been added to the subject. True to-day we understand the subject much better than Faraday ever did. The mathematical researches of Helmholtz, Thomson, Maxwell and others have thrown a flood of light upon the induction of electric currents, and the law of the conservation of energy gives us means of proving all its laws, and indeed of showing that magneto-electric induction is the consequence of the magnetic action of the current as discovered by Oersted.

But fifty years ago this law of the conservation of energy was too little known to be used in this way. It required the support of just such experiments as those of Faraday to bring it into existence and to prove it. Hence Faraday had but little to guide him to the discovery, except that subtle reasoning of a man of genius which almost amounts to instinct.

The difference of common and voltaic electricity next engaged his attention. A Leyden jar highly charged, might have large sparks and a loud sound; it might ignite alcohol and produce a strong shock when passed through the human body; but it was almost incapable of decomposing water, and could scarcely affect a magnetic needle. The voltaic battery, on the other hand, could produce the latter effects, but not the former.

How did these two kinds of electricity differ?

Faraday answered this by producing all the effects with one kind of electricity that could be obtained from the other. He showed that the difference was caused by there being great tension, or, as we call it, potential in one case, with very little quantity, while in the other there was great quantity with low tension. By charging Leyden jar batteries of different sizes with the same number of turns of his machine, and discharging them through a galvanometer, he proved that the sudden deflection of the instrument depended on the quantity, and not the tension, of the electricity. He then arranged a little voltaic battery out of a zinc and platinum wires, so that, when joined to the galvanometer for three seconds, it gave the same swing to the needle as the Leyden jar battery charged with thirty turns of his machine. By this means he was able to estimate that a small battery which decomposed a grain of water, furnished as much electricity as 800,000 discharges of his large Leyden battery, and would form a powerful stroke of lightning, if discharged at once.

This investigation gives us the first rough idea of the magnitude of the quantities involved in frictional and voltaic electricity, and it may be considered as the first rough approximation to the ratio of the electro-magnetic to the electrostatic units of electricity.

But Faraday was a chemist. His association with Davy had made him familiar from the first with the chemical action of the battery, and it is but natural that his attention should be directed to its investigation. In the progress of these researches he noted the curious fact, that all bodies which could be decomposed by electricity when fluid, could neither conduct the current nor be decomposed by it when they were solidified by cold. The conduction and decomposition went together. Rising from this to a general law, he finally proved, by immense labor, that, for a given quantity of electricity, whatever the decomposing conductor may be, the amount of chemical action is the same. The current, the size of the electrodes and the strength of solution might vary, but the amount decomposed by a given quantity of electricity remained the same. Furthermore, the amount of different substances separated was in proportion to their chemical equivalents. Hence, the voltameter for measuring the electric currents which, in the form of the silver voltameter, is to-day one of our most accurate instruments.

As I have mentioned before, the leading idea in Faraday's mind was the replacing of all action at a distance by curved lines of force which had a definite physical existence. So,

GEO. L. BEETLE, VICE-PRESIDENT OF THE ELECTRIC CLUB.

in attacking this subject of electrolysis, he very quickly showed that Davy's idea that the poles separated an electrolyte, by actually attracting its components, was false, and that the theory, according to which decomposition and recomposition took place throughout the whole course of the current in the electrolyte, was correct.

Faraday now took up an analogous subject—the source of the electricity in the voltaic battery. He showed that the current from the battery was proportional to the amount of zinc dissolved, and that the direction of the current depended on the direction of the chemical action.

HENRY HINE, CHAIRMAN COMMITTEE ON MEMBERSHIP.

The theory of Volta, that the contact of two metals was the source of the electricity, was thus effectually disposed of; so that even the recent attempt to revive that ancient theory could only have met with the disaster which befell it.

It is impossible for me, in a few minutes, to give account of all that Faraday did on these subjects of electrolysis and the theory of the voltaic battery. His work is a perfect mine of results—not haphazard and discontinued, but each designed to elucidate some point in theory or demonstrate some law and his name must forever be associated with this subject. His law of the definite chemical action of the current will always form an enduring monument to his fame.

Every discovery that Faraday made only served as guide to him in making fresh ones.

We have seen that Faraday found that when an electrolyte was in the solid state, it no longer conducted the current. To most observers this would only have been an interesting, but disconnected fact. But the far-sighted mind of Faraday perceived in this an explanation of no less a subject than that of electric induction. As in the electrolyte, he conceived the particles to be arranged in certain directions, decomposing and recomposing along lines in the direction of the electric currents, so in the solidified electrolyte there was some arrangement along the lines in which the current wished to pass, that is, of electric force. Hence his theory of the nature of electric induction and of electric force. It was not action at a distance, but the action of contiguous particles on each other. As in magnetism, so in electricity, the action was carried to a distance by a medium.

Not content with giving merely the theory, he proceeded to prove it. If it were true, then the nature of the medium should affect the amount of the induction. We all know his beautiful apparatus for testing this: the two globular Leyden jars which could be filled with air, glass, oil of turpentine, gases, etc. How he divided the charge of one between the two and measured it on a Coulomb electrometer, and thus discovered that his inference was correct, and that each substance had a specific inductive capacity. That the charge of a condenser depended not only on the area of the surface and the thickness of the dielectric, but also on the nature of the latter, air or vacuum producing the least condensing effect, and glass, sulphur, etc., a greater one.

To complete his mental vision of an electrified system, it was necessary for him to test in a very complete manner the idea that positive and negative electricities are generated in equal quantities. To accomplish this, he erected a room of twelve feet on a side out of a framework covered with tin foil, and the whole insulated. By generating electricity inside of it, he was able to prove in a more complete manner than had been done before, that we never generate positive electricity or negative electricity by itself, but always in equal quantities together. Every complete electrostatic system contains equal quantities of positive and negative electricity, which are separated by a dielectric, through which they are connected by the lines of electric induction, whose tension produced electric attraction.

To-day, when the mathamatics of Maxwell have added clearness to the subject, we see every electrostatic system made up of minute and equal portions of positive and negative electricity, connected together by tubes of induction as by elastic bands, these tubes repelling each other laterally, so as to be held in position, we know that the attraction of all electrified bodies is accounted for by such a system, which was roughly conceived by Faraday, but in which the positions and form of every line can now be calculated.

It is impossible, on the present occasion, to follow Faraday through all his researches on the different forms of electric discharge, and his continued researches on electrolysis; but I will pass immediately to two of his greatest discoveries, the action of magnetism on light and diamagnetism. In his researches on optical glass he had discovered a variety of heavy glass, called silicated borate of lead. On placing this between the poles of a magnet, and looking through it along the lines of force, he found that the plane of polarization was rotated.

Using other substances, he found that most of them had some effect of this kind in the magnetic field. The laws of the magnetic rotation he found very different from those of the ordinary rotation of turpentine or sugar, and altogether it forms a most interesting and important experiment when considering the theory of magnetism.

Not content with discovering this law from his piece of optical glass, he now sought to discover whether there was any force of attraction or repulsion between it and the magnet. Hanging it up between the poles, he discovered that as iron was attracted by a magnet, so the heavy glass was repelled. He called this property diamagnetism, and showed that all bodies were acted on by magnetism and could be classed as magnetic or diamagnetic.

Magnetism now had a universal significance as applying to all bodies. It was universal in its action, and all bodies responded to it to some extent at least. Even gases were acted on by it, and the oxygen of the air was found quite strongly magnetic.

Quickly his mind seized another idea.

As the intense magnetism of iron, nickel and cobalt was destroyed by heat, might it not be possible that all bodies should become magnetic by cold? He carefully tried the experiment, but never was able to find any effect with the means of producing cold at his command.

In reading Faraday's papers we are surprised at the clearness with which his laws are expressed. Although he naturally wished to bring his lines of force into use in this case of diamagnetism, yet we now find him making no use of them. His law says that magnetic substances in the field of a magnet tend to the stronger part of the field, and the diamagnetic to the weaker, irrespective of the direction of the lines of force.

Bismuth he found the most strongly diamagnetic of all bodies. In using a crystal of this substance instead of a bar, he found that it would set itself in a magnetic field, even if this was uniform. On using other substances he proved the general law that all crystals possesed this property and he called it magne-crystallic force.

The researches on diamagnetism and magne-crystallic force, occupied Faraday's time for five years, from 1845 to 1850, and he was now in the sixtieth year of his age. No more great discoveries fell to his lot, but his mind turned more and more to brooding over the consequences of his past discoveries and following out their results.

The idea of lines of force was still on his mind, and the discovery of diamagnetism had now given him a further insight into their natures. He saw that the magnetic and diamagnetic nature of bodies could be explained, by considering them as good or bad conductors of these lines of force. Iron was a good conductor and bismuth a bad one. When soft iron was placed in a magnetic field, the lines of force, or, as we now more exactly term them, the lines of induction, were more easily conducted by it than by the air, and they were deflected toward and through it; but a piece of bismuth was a poorer conductor and these lines of force tended to pass around it rather than through it. By surrounding a weak magnetic body by a strong magnetic fluid he found that it possessed all the properties of a diamagnetic one. Pursuing the subject, he showed how

the lines of induction were distributed around and within a magnet, and how we are able to measure them by the induced current in moving wires. The method of exploring the magnetic field is the only exact method which has ever been devised for use in such cases as the field of modern dynamo electric machines, or in most of the problems of modern electrical engineering. He also proved that the lines of induction are always closed circuits, whether they are due to permanent magnets or to electric currents, thus forever destroying our hope of obtaining a continuous current by induction without the use of a commutator.

When a soft iron bar was approached to the magnet, it drew the lines in upon itself; they proceeded down the bar until they were forced into the badly conducting air and the number which went further down the bar to those which passed out into the air at any point was in proportion to the conductivity of the two. A steel magnet was, in his eyes, like a voltaic pile in water. As the current of electricity was forced forward by the electromotive force of the pile and diffused itself in currents through the water, so the lines of magnetic induction were formed by the coercive power of the steel. It is now known to be a fact that the distribution of magnetism on a steel magnet, or indeed in any case, can be calculated by these principles Faraday laid down. The idea of a magnetic circuit is familiar now to all electrical engineers.

To Faraday's eye, a magnet not only consisted of the piece of steel or loadstone which is apparent to our ordinary vision, but it included all the space around it which which was filled with lines of force; it was bounded only by the limits of the universe. The steel served merely to bind together the ring-like lines of induction which passed from the magnet to every point of space.

Faraday was not a mathematician and could not thus follow out the consequences of his great ideas This has been done for him by the immortal Maxwell. He has taken up the idea that electrical and magnetic forces only proceed to a distance by aid of the intervening particles of matter, or ether, as the case may be, and has given it an exact mathematical basis.

To-day a body charged with electricity, a magnet or a wire carrying an electrical current, all are incomplete without the space around them.

When we attach a battery to a wire and the current apparently flows through it as if it were a current of water, Faraday's idea shows us that we are looking at the matter only superficially; around that wire, and permeating space in every part, are lines of magnetic force, and lines of electrostatic force. At the moment of joining the battery to the wire this whole complicated system of lines of force must be formed. At the moment of breaking circuit, the system must vanish, and we obtain the energy stored up in this space surrounding the wire in the bright spark known as the extra current.

What a flood of light this throws on many experiments such as those of Wheatstone, on the velocity of electricity. With his wire arranged in parallel loops around an ordinary room, he discharged a Leyden jar through it, and assumed that the electricity passed through the whole wire, before a spark could form at the distant end. But we know that the whole room was instantly filled with moving lines of magnetic force, which induced currents in every wire they crossed; and hence what Wheatstone measured was merely the current induced from one wire on those near it.

Thomson and Maxwell have shown that the medium around a wire carrying an electric current is in motion, and that the vortex filaments form Faraday's lines of magnetic force; for Faraday's discovery of the magnetic rotation of the plane of polarization of light can be explained in no other way.

Thus the discoveries of Faraday have been engrafted on our science, and form one of its most essential features. They are among the foundation stones of the edifice of our science.

We know far more than the electricians of that day, in the details of the subject, and mathematics has given us a broad view of electricity and magnetism, such as never before was obtained. In its practical use and measurement we have made immense strides in devising methods and instruments; and we now carry out our experiments on a scale which Faraday could not attempt, seeing that the subject, which has hitherto been best adapted to the contemplation of a few philosophers, has become of use to all, and electricity bids fair to become our most important servant.

The spark, which Faraday more than fifty years ago observed in a darkened room, now blazes out with almost the power of the sun, but it is still the spark of Faraday. Though it is a thousand times as large, it is still made on the principles which Faraday laid down, and nothing, except mechanical details has ever been added to his process.

How suitable, then, that we should remember his name on this occasion, when his discoveries have served as the basis of all progress in electrical engineering. Had Faraday not lived we should not have been here to-night. True, as I have shown before, the progress of science could only have been delayed by the absence of any one man, but how long, in this case, we cannot tell. We can only receive with gratitude what Faraday has given freely to us, and speak his name with the reverence due, not only to his intellectual eminence, but to his character. Too noble to leave science for the wealth held out to him, he persevered in it to the end, and gave to the world the fruits of his labor in his "Experimental Researches in Electricity."

M. W. Goodyear, Chairman House Committee.

He never obtained from the world the material reward for his labor, but died a poor man, who had enriched a world.

We stand at an important epoch in the history of our science. We have gone far enough into its practical applications to see some distance into the future. The arc light, which Davy brought into prominence at the beginning of this century, fed by the machines of Faraday, blazes throughout the night in all cities of the world. The incandescent light, known long to scientists, has been improved, and bids fair to rival gas in cheapness, as it surpasses it in beauty. The secondary battery, discovered by Ritter eighty years or more ago, improved by Planté, and Faure, in recent times, still struggles to fill the place assigned to it, to be replaced by one before long which shall not waste fifty per cent. of the power given to it, and weigh tons for a few foot pounds of energy stored up. We see it in its new form replacing the laboring horses in the streets, and serving in many cases where small power is needed.

But the transmission of energy seems to me to open one of the widest fields, and the time is not very distant when a few large engines will replace the numerous small ones in our cities; when also the power of waterfalls may be made available at a distance.

The principle of the telephone also is destined to bear unseen fruit.

There is work for all, the practical and theoretical man alike.

The philosopher, studying the problems of the universe, deems himself rewarded by some new fact discovered, some new law demonstrated. To him the universe is a problem to solve and his motto is, "Science is knowledge."

He sees before him the time when man's insight into nature shall be vastly increased, and esteems the science of to-day as but an atom to what we shall know in the future. While not despising wealth, he seldom has time for its accumulation, as he considers other things of vastly more importance; the truth is what he seeks; the truth as to what is matter, what is electricity, what is the medium which transmits light from one point to another, how comes it that the earth is magnetic? these are some of the problems he is striving to solve. He knows that one man can do but little toward it, even though he should surpass what Faraday has done, but he trusts to the combined efforts of mankind, shown in the steady progress of science, to finally arrive at a solution.

The devotee of applied science, the so-called practical man, looks upon the forces of nature as his servants, and strives to become their master. The world must move, its work must be accomplished. We are not satisfied to live as our fathers have done, and we must have luxuries unknown to them. Our thoughts must fly to the furthest parts of the earth in an instant, at our bidding and we must pass from point to point on the wings of the wind, for flesh and blood is too slow for us. To accomplish this, the engineer harnesses the forces of nature, and compels them to work for him. He takes the discoveries of the philosopher, and uses them for the practical needs of daily life. His motto is, "Science is power." As he ministers more directly to the present generation of mankind than to generations to come, as does the philosopher, so he often reaps his reward in the present, and retains some of that wealth which his inventions bring into the world. For the source of the wealth of the world is labor, and the labor of the forces of nature, in our behalf, surpasses very many fold that of human flesh and blood. He who adds but the slightest to our power over these forces, enriches the world, and is entitled to its practical, as well as its sentimental gratitude, be he philosopher or engineer. The great question which we should ask ourselves is how our science can best be furthered. The philosopher must precede the engineer. To have the applications of electricity, there must be a science of electricity. This science cannot depend for its existence on practical men whose minds are engrossed with other than theoretical problems. It must exist in minds like Faraday, which are specially adapted to its reception and advancement—men who are willing to devote their lives to it, and who have the ability to further it. We cannot create such men, but we can give them our practical, as well as sentimental sympathy, when found. The philosopher is made of flesh and blood as well as other men. He must live and have his tastes gratified as well as others. His place in the world as at present constituted is usually that of a professor in our universities and colleges. Are only men like Faraday chosen for these positions? Of the four hundred or more, how many choose their professors on account of their eminence in theoretical science? Are there a dozen? I doubt it. Furthermore, what facilities and encouragement would they have in these institutions to do work. Too far away from each other to be a mutual help, they have but an incomplete scientific life. Faraday could not have been himself in Africa and would have languished in our own country. In London, in contact with the science of Europe and encouraged by its atmosphere, with the Royal Society at which to announce his discoveries, and the Royal Institution in which to make them, Faraday, in spite of poor education, was stimulated to his best efforts. Alone in one of our isolated colleges cut off from intercourse with the rest of the world by a so-called protective duty on his very life, books, with no journal specially devoted to theoretical physics, and no society like the Royal Society, who can say whether his discoveries would have been made or not?

The endowment of research seems to me to offer the best means out of the difficulty. Let professorships be endowed and funds to pay the expenses of apparatus and assistants be formed in our universities, with the understanding that research is to be the principal work; work, while teaching is not to be neglected. The result will be the formation of a scientific atmosphere in which men like Faraday can live and labor, and the dry bones of the pedagogue be replaced by the fire and life of the original investigator. And let not practical science be neglected. Let us have scientific schools of the highest grade, where modern science is taught, so that fifty years shall not again pass, as it has done, before a discovery like that of Faraday is utilized.

Furthermore, let us have scientific societies and clubs like the present, where men of like tastes can meet and interchange ideas.

Thus we meet together to night, electricians all, practical and theoretical, at a time in the history of our science to the world which will in future be called the beginning of the age of electricity.

The feeble attraction of the amber has become a mighty force, which is destined to make itself felt, and it is to be hoped that our mutual intercourse in this club may aid us all in our efforts to make an impress on its future history. (Long applause.)

John C. Tomlinson, Chairman Entertainment Committee.

The president now declared the formal ceremonies ended, and the assembly separated and did ample justice to the splendid supper provided for all. The large lecture room on the second floor was, for the evening, devoted to dining purposes. In the library President Davis and Vice-President Edison entertained the invited guests and several of the members, including Prof. Rowland, Mayor Hewitt, Prof. W. A. Anthony, Prof. D. M. Green, Prof. Geo. Plympton E T. Gilliland, Leonard E. Curtis, John Rooney, Gen. John Newton, Hon. John C. New, Captains Erben and Cooke, U. S. N., Capt. Zalinski, U. S. A., C. J. Woodbury, Gen. Greeley, Prof. Geo. Forbes, J. C. Tomlinson, Judge Broadnax, Col. Albon Man, and others.

PRESENTATION TO PRESIDENT DAVIS.

The gentlemen were brought together in the parlors about 11 o'clock, and called to order by Capt. W. L. Candee, who said Mr. J. C. Tomlinson had something to say to the president.

Mr. Tomlinson: *Mr. President and Gentlemen:* The members of this club individually have expressed one to the other their appreciation of the untiring devotion and energy which the president of this club has devoted to promoting its welfare.

(*Continued on Page 7.*)

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EDITORIAL ANNOUNCEMENT.
Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West.
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NEW YORK, FEBRUARY 4, 1888.

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The new Club House is a veritable Aladdin's Palace, and may be said to be presided over by the famous Geni of the lamp.

The ladies in London are becoming interested in our science, and are fast abandoning the afternoon sewing bees and "high tea," and taking up "electricitee" instead.

That's not a bad proposition for the disposition of abandoned gas and oil wells, viz., to cut them up in six-feet lengths and sell them to the telegraph and electric light companies for post holes!

Another new application of electricity is the purification of city sewage, and the precipitation of all solids to be used as manurial matters. Experiments are now in progress in London, and will bear close study.

Everyone was disappointed in not finding the phonograph on hand at the Electric Club House opening. It would have been a great thing to record a sentence or two from each member, and file the records away in the archives, but the improved instrument will not be ready for about two weeks.

In view of the recent great fire losses we think it would pay for the city to appoint a commission to investigate the feasibility of adopting electric pumping engines along such thoroughfares as have electric light circuits. There would be no fires to start, or steam to make, and a full head of water could be obtained at the very instant of connection with the plug. It is well worth consideration by insurance interests.

Why not locate at Niagara a tower a few thousand feet high, and with turbine wheels at its base generate a current of say 100 volts and 100,000 amperes, and with that drive one gigantic arc lamp on the tower, and by the irradiation light the whole State, and part of Canada?

Reverse the usual order, put the negative carbon uppermost, and send the 13 000 H.P. light into the atmosphere. What a magnificent spectacle it would be!

State Senator Coggeshall, of New York, has introduced a bill, which was before the Legislature last year, to provide for a State electric commission to supervise and regulate telegraph, telephone and electric light companies. The commission is to consist of eight members, to be nominated by the Governor and confirmed by the Senate. We would respectfully ask the Governor, if this bill becomes a law, to nominate at least one electrical man, say one possessing the ability of Mr. E. T. Gilliland.

The REVIEW desires to make its best bow to the large number of electrical workers in all parts of the country who so often send it important items of news. These things make glad the editor's heart and give the readers of the REVIEW much desired information. In addition to an intelligent staff of regularly employed correspondents, this journal has a host of observing friends in every branch of the business, and often through their thoughtful remembrance we have received important matters of general interest. Such news is always very desirable.

The REVIEW presents in this issue not only a view of the front of the Electric Club's house, but also the countenances of several of the officers. Departing from our usual custom, for the first time are presented in these columns portraits of individuals. On such an occasion it is fitting to introduce to our readers a few of the earnest workers in establishing electrical headquarters in the metropolis. Many others have labored as hard, and deserve full praise for their loyal work. Our readers cannot fail to note the fine appearance of the men whose likenesses we present, and it was the remark of the honored guests, on the occasion of the opening, that a finer appearing or more wide-awake body of men in every way had never been seen in any scientific or social gathering in this city.

THE ELECTRIC CLUB.

It must be indeed a gratification to the founders of the Electric Club of this city to ponder over the great measure of success they and their gradually increasing band of followers have obtained. The formal opening of the new club house last Tuesday evening was most auspicious and flattering.

The club is now thoroughly established, with the satisfactory roll of 400 active members, and possesses one of the finest club houses in the city, appointed and equipped in a manner superior probably to that of any other club in the world.

The doubting Thomases, who at first stood aloof from the onerous missionary work attendant upon the undertaking, have one by one seen their error and come into the fold as the club's earnest supporters; and as those who were merely disinterested outsiders in the harvest field or workshop of electricity saw the gathering current of enthusiasm, similar currents, as it were, became induced in their own feelings, and we have to-day the pleasure of announcing that the Mecca has been reached, and the club placed upon a foundation which will, without doubt, permanently endure.

The original design of the club—to bring together at intervals all interested in the development of electricity, for the temporary burial of all feelings of rivalry and the interchange of social pleasures—has been gradually expanded, until now the members look forward to the monthly meeting as an opportunity for the interchange of ideas and information, for hearing the instructive debates on electrical questions of the hour; and between the times of regular meetings, they have the advantage of the club house as the headquarters of the electrical fraternity of the whole country, where they can daily meet each other on the most friendly footing, and quietly discuss problems of mutual interest. They will have at hand a magnificent and very complete library of standard works and files of periodicals on electricity and kindred sciences. They have in regular operation in the house a modern high-speed engine driving two different styles of dynamos, storage batteries, and a great variety of electrical appliances, and discussions can be frequently placed on the basis of an experimental lecture by adjournment to the power and dynamo rooms down stairs.

What a contrast between the picture thus presented, of the happy hearthstone circle of science, culture, art and commerce, and the homeless and cheerless scientific associations of this and other countries, which meet at stated intervals in some cheerless public hall, listen all day, perhaps to the exposition of some aggravatingly abstruse theorem, while at the same time half the listeners do not care whether the final equation comes out plus or minus, so long as they are hungry for something other than the dry details of blackboard art, lacking the condiments of comfort, companionship and common interest.

The excellent example thus set by the electrical interests of this city has been appreciated elsewhere, and the Electric Club of Chicago, and that of Boston, are fast assuming important proportions. Let them adhere steadfastly to the principles and objects of their organization, and we prophesy for them a happy future, full of good to their members.

The unique character thus proved capable of being conferred on a scientific association has attracted attention across the ocean, and we are glad to note the efforts of our English cousins-in-electricity towards the establishment of a kindred society in London. They are very slow, characteristically, in getting into shape, and just now the great question which agitates the breast of the precise English electrician, electrical engineer, or whatever he styles himself, is the selection of a name for this Yankee idea of social equality in the realms of workaday science. They somehow seem to think a rose would smell more sweetly if spelt with ten or more letters. However, they will, no doubt, succeed and we wish them every support and prosperity.

To the loyal and sacrificing spirits whose efforts have contributed to the final success of the first Electric Club—whose one thought has been its betterment, whose dream has been the founding of a national guild-hall for the scientific and commercial fraternity of electrical men, and whose hopes have been now fully realized in the establishment thrown open this week—to these earnest gentlemen, the REVIEW offers its sincerest and heartiest congratulations.

May the Electric Club always increase and prosper!

STEEL HARNESS FOR NIAGARA.

The latest wildcat scheme graced with an electrical cap-feather is the harnessing of Niagara Falls into an immense electrical generating plant. The inventor (?) says:

In the first place, shore abutments of granite will be erected on each side of the Niagara River, just above the falls. A steel cable ten inches in diameter will then be stretched across and fastened to the abutments. Connected with the cable are to be large flat boats made of steel and loaded with ballast; in the rear of the boats are large wheels connected together by a universal coupling shaft, so as to allow the current or ice to move the boats without interfering with the revolution of the wheels. This shaft is to be connected with an immense power house on the American side, in which will be located any number of powerful dynamos that will generate electricity, which will be sent to Buffalo and Rochester, N. Y., and other cities by cable.

Reads quite glibly—very attractive. But there are a lot of "buts" about the scheme. Quite a nice spectacle to see a twenty-inch solid steel shaft "flexibly" joining the shafts of a fleet of flat boats hanging over the brink of the falls. Why not go at it gigantically while doing it at all—build a big steel arch across the rapids, and journal in suitable hangers an immense undershot wheel close to shore? It never freezes up at Niagara, of course, and such trifling objections as ice bridges are not to be thought of for a moment.

LONG RANGE LIGHTING.

As one of the most marked instances of the advantages of transformers in electrical distribution, we note a new station under the Westinghouse system at Edgewood, a suburb of Pittsburgh, now in successful operation. The circuit is in all eight miles long, and the distance from generators to point of distribution four miles. A No. 4 wire is used for the line, and at present there are about 500 lights in use at the distant point, but wiring goes forward as rapidly as possible for nearly 5 000 more lights. This will be, when finished, the most important illustration of long distance distribution yet attempted, and, so far, not a hitch has occurred.

It is said that a wonderful "ageing" effect is produced on whiskey by placing an electric light in a barrel of the liquor. We presume this means an incandescent light lowered through the bung. The experiment is an easy one to try, and we are not prepared to say it would be a failure. Light is a powerful factor in inducing chemical and physical reactions, and really might have great virtues in driving the fusel oil out of the whiskey. But it by no means follows that the swallowing of an incandescent lamp after a charge of "Jersey lightning" will prevent the headache next morning. It would take the lost light of a solar eclipse to do that.

OUR CHICAGO LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

"A new telephone company in Chicago, to compete with the Bell monopoly, will soon be an assured fact, provided the city council looks favorably upon the scheme," is what one of the Chicago papers said the other day. The Cushman Company have asked a franchise to do a general telephone business in the city, as competitors of the present company. The Cushman Company embraces among its officers City Treasurer Plautz, president; County Treasurer Davis, vice-president, and Clarence Knight, Assistant City Attorney, attorney. Said Mr. Plautz, when interviewed:

"What we want is the privilege of laying wires in all parts of the city, just as it is enjoyed by the Bell Company. We don't ask for any more privileges or benefits than they have. We can furnish telephone service for $80 per year, and better than the present service. If we get a franchise the company will be enlarged; that is additional capital will be raised, and we will go to work at once."

As friend Pierce would say, "Can you do that, and keep your job?"

One of the officers of the company, in reply to some interrogatories, said:

"Dr. Cushman, who invented our instrument, made the first telephone, away back in 1851. He was then making a telegraph line from Racine to Beloit, Wis., and discovered the telephone principle by accident. In making a lightning arrester he placed the box, with the wire connections, in a swamp, and sixteen miles further on put up another. One day he chanced to get his ear close to the box and was astonished to hear the croaking of frogs in the swamp, sixteen miles away. He then began experiments over the wire, and the result was what he called a 'talking box.' The device was used for several years by different parties and that is the reason we claim that the Bell Company has no right to their patent. Bell's invention of 1875 was the talking machine of 1851. You talked into and received from the same box. It was the transmitter—which was not invented by either Bell or Cushman—that made the telephone. We are the only fighting competitors of the Bell Company, and we went down to Indiana and went at them boldly."

Inasmuch as January is the month for striking balances and comparing statements, suppose we put that and this together, and see what sort of companion pictures they make, framed. This is from a Chicago daily, also:

"MICHIGAN TELEPHONE OPERATIONS—The St. Clair and Sanillac Telephone Company, 150 miles in extent, using the Cushman telephone, was sued recently by the Bell Telephone Company, for alleged infringement of patent. Now comes the information that, rather than stand the suit, it has accepted an offer from the Bell Company and transferred to the latter its franchises, instruments and good will. The Bell Company took possession yesterday. Managing Director Jackson, of Detroit, of the Michigan Bell Company, says the Cushman instruments used by the St. Clair and Sanillac Company will be replaced immediately by Bell telephones. There will be no immediate change in tolls. The Bell Company paid something near $100 per mile for the property."

Springfield, Ill., is to have an electrical supply company, to manufacture fire and burglar alarms and other electrical apparatus. Capital $50,000; incorporators, Andrew Seuchman, R. B. Hoover and Frank W. Wellman.

And, by the way, speaking of power, Chicago is now open to the motor fellows, the only restriction being that the power lines shall be power lines exclusively. Motors for motor circuits, arc lamps for arc lamp circuits. This will open the immense field where the motor boys have been telling us there are thousands of motors wanted. The race is a "free for all," and lively times are anticipated. As a most general way of advertising the fact, the REVIEW correspondent thus calls for entries in the race.

The Thomson-Houston Company has just completed a large plant of both arc and incandescent lights at the Union Depot on Canal street, west side. The work has been in charge of Mr. F. H. Soden, and on Thursday evening the two Ball automatic engines and four dynamos commenced the labor of lighting up the depot and tracks from north of Madison to south of Van Buren. Somewhere near 850 incandescent and 60 arc lamps filled the heretofore dismal buildings, of which there are three, and the dingy tracks in the yard, with a flood of light such as none but a lunatic would have been likely to conceive a few years ago. Master Mechanic Potter, of the Ft. Wayne road, was present at the inauguration, and expressed himself highly satisfied with the result. C. C. H.

Chicago, Jan. 30, 1888.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The Baxter Motor Co. report that they are meeting with good success with the motor installed in the factory of the American Watch Co., as well as with one started this week to run the presses of the Attleboro *Advocate*, Attleboro, Mass. Their special attention is now given to furnishing motors for cash railway systems, and they are making extensive arrangements for such application.

A novel idea is soon to be tried in Providence, R. I. An apparatus has been made by the Armington & Sims engine people, which is to be used in connection with a Baxter motor, to sharpen the shoes of the horses used on the Providence Horse R. R. The work will be done with dispatch in the horse's stall.

On Feb. 1st there will be in actual operation in the company's office at 178 Devonshire street, a large Baxter motor running a low-tension incandescent machine, the current from which will be used to light the office, for an illuminated sign, as well as to run several small motors to be used in connection with fans, ventilators, etc.

Considerable interest is felt among electric light people here regarding the suit of ex-Alderman Haldeman against Mr. Edwards H. Goff to recover salary and expenses as general manager of the American Electric Co. The decision of the court awarded Mr. Haldeman $6,900.

In the January number of an esteemed contemporary mention is made, under the heading "The Wrong Way and the Right Way," as follows "We hear, for instance, of one line on which an attempt is to be made to work grades of over 700 feet per mile with electric locomotives, for passenger service. Unless special precautions are taken, as, for example, on the Mt. Washington or Mt. Cenis inclines, to undertake such a feat is to invite disaster." Now, for some weeks there has been a road in operation in Allegheny City, Pa., installed by the Thomson-Houston Electric Co., on which grades of over 730 feet per mile are ascended with ease, using no such precautions as suggested. Two 15 horse power motors are attached to each car, the expense of installation and operation being less than had a cable system been installed.

At an "electrical dinner" recently, the old Keely motor problem was revived. Among varied expressions regarding its failures and requirements was one which is extremely expressive to the average American. "That motor will never succeed," said the speaker, "without a centerboard."

A reception was given on Monday evening, the 23d inst, by the Lynn Young Men's Christian Association, to the male employes of the Thomson-Houston Electric Company. After some pleasing music, both vocal and instrumental, an interesting talk on electricity was begun by Mr. A. L. Rohrer, an electrician of that company, which he had to terminate after a few moments, because of sudden faintness. I am glad to hear that he is feeling better now.

A successful trial was made a few days ago on the electrical railroad at Easton, Pa. The road is one mile long, with a grade of eight and one-half feet to one hundred for about one thousand feet of its length. Current is supplied by a 50 horse power dynamo, and a 15 horse power motor is used. Eighteen persons rode on the car during the trial trip, and a successful run was made with but two-thirds of the power in use.

The Boston Heating Company, which laid pipes through the streets a short time ago to heat buildings by superheated water, has begun operation, and is supplying subscribers on Washington, State, Summer and Congress streets. It is expected that the system will be rapidly extended during the month.

The Simplex Electrical Company reports increased sales of their simplex "T. Z. R." wire. It seems to be a wire in great demand for difficult line work. T. W. S.

Boston, Jan. 30, 1888.

ELECTRIC CLUB OPENING.

(*Continued from Page 5*)

I have been asked on behalf of the club, and as representing them, to publicly express to-night, in the presence of you all, the appreciation which the members of the club individually, and the club as a body, have for the efforts of the president in making a success of this organization. I will not tire you at this late hour by making any formal address, but I now have the honor—an honor which is overshadowed by the pleasure—of presenting to Mr. Davis, on behalf of the club, this evidence of their regard, and in presenting it I trust that every enterprise with which Mr. Davis is connected may prove as successful to him as his efforts have proved to the club. (Loud applause.) I have the honor, sir, on behalf of this organization, of presenting you with this testimonial of their regard.

MR. DAVIS:—The little that I have done for the club, if it has been successful—and certainly your assumption here by this testimonial is that it has—is sufficient reward in itself. But I must confess there is a gratification in receiving something that I can always carry with me, and that I can hand down as an evidence of your kind feelings towards me. I can only sincerely thank you for this beautiful watch.

Mayor Hewitt was loudly called for and responded as follows:

MAYOR HEWITT'S REMARKS.

GENTLEMEN—I suppose everything has to give way to this electrical force of which you are the masters. You have taken me, however, at a disadvantage. It seems to me that I am a great deal like one of Edison's worn-out phonographs. I have written three messages, the last one of which got out to-day, and I have no doubt you will all be glad to learn that it is the last; I know I am. But, really, I have had visions that I never supposed in my time would come to pass. I was taught, when I was a boy, by very good people, that there was such a thing as the millennium which is to come, but since I have been Mayor I have not believed a bit about it. (Laughter.) It rather has shaken my faith in revealed religion. But while the electric lamp holds out to burn (loud laughter) I don't know what possibilities, or what limits to the possibility of electrical science there may be. But when we reflect about it, all we know about it practically (I mean with reference to its practical applications) is within the memory of very young men here. I remember myself, in 1844, going to the Polytechnic Institute in London and seeing a steam boiler in operation, from which issued a current of electric light as big as my arm, or bigger—from an ordinary steam boiler, as far as I could see—and it may seem extravagant that I should say it, but it was a fact that I said that anything that could come out of a steam boiler in such volume as that must prove of great use at some time. But I forgot all about it until Edison woke us up with his marvelous discoveries (applause), and I have been looking on wondering with amazement whether I was in that world where I had been brought up, or in another world.

You are the couriers of the coming millennium. (Applause.) What you are going to accomplish passes the wildest imagination of man. Most of the evils of society—those that we now know—will disappear, but you will introduce other evils, of which we know nothing. (Loud laughter and applause.) You will have to reconstruct society; all the habitations of man, and all his habits, too, will have to be remodeled; the jurisprudence of the world will have to be reformed and adapted to the new condition of things; criminals will be converted by a much more rapid process. (Laughter.) I don't know why you should laugh, for there does not seem to me anything shocking in it. (Loud laughter.) I think that very likely a man may go to bed at night a quiet, contented citizen, and wake up next morning and find he is mayor of this city. There is one thing—I doubt if you would be able to make it a bed of roses, but you could enable him to get along without writing so many letters. (Laughter.) If you will just hurry up before I go out of office, you will save me a great deal of trouble.

But in the meantime, if you will take up and solve the question of how to propel cars underground in tunnels, at the rate of forty miles an hour, so as not to vitiate the atmosphere, and make everybody feel better, and also conscious of the fact that he lives in a world that is now really beginning to do something, you will relieve most of the difficulties which I have on my mind. (Loud applause.)

Three cheers and a tiger for Mayor Hewitt were given with a hearty good will.

There were loud calls for a speech from Mr. Edison, who, not being in the room, did not respond. But he was presently discovered coming quietly down the stairs, unconscious of the calls for his name. When about two-thirds of the way down, he heard the cries of "Edison!" "Edison!" and casting one horrified look into the parlor, where all faces were turned toward him, he turned and dashed up the stairs, three steps at a time, followed by several members, who overtook him, and brought him into the parlor. All that Mr. Edison could be induced to say, however, was his: "I can't make a speech." Come to think of it, who ever heard the famous inventor make a speech in public?

Cries of "Tomlinson for Edison!"

MR. J. C. TOMLINSON. Gentlemen, I can't speak for Mr. Edison. I think he is fully able to speak for himself. If I were to speak for Mr. Edison all I could say would be to quote from the Scriptures—which is a very appropriate thing in an organization of this character—"By his works shall ye know him." (Applause).

DR. OTTO A. MOSES was called for, and said: Mr. President and gentlemen of the Electric Club, I really feel as if I ought not to say anything. One reason is because I do not deserve to come before you after having taken flight to Europe just at the beginning of the work connected with this club, when I ought to have come up for duty. But I come back and find everything blooming and flourishing. However, something of the experience I have gathered abroad may be interesting, and make you feel a certain thrill of satisfaction. I have found that all the progress that has been made in electric lighting can be appropriated by the Americans. In England I have found that legislation has hampered everything to such an extent that they have given us a wide field. It will take Parliament two or three years to alter the laws it has already made that have hampered electric lighting, and I think we are going to profit by it in this country. I found pretty much the same thing in France. And, gentlemen, you here, as representatives of electrical interests and of yourselves in a social way, are far in advance of anything that has taken place on the other side. I congratulate you most heartily about it.

I was told that this beautiful present made to our energetic president was given by the club, and I say "honor to whom honor is due." I did not have an opportunity to contribute to it, and I regret it every time I think I did not. It is a substantial contribution to the president of this club for what he has done in the way of bringing socially into prominence something that has been only in a commercial form before—that is, the electric interest.

I see that a man whose time is so valuable as that of our honorable Mayor has been brought here—in spite of himself, perhaps. Our influence will be always for good, and perhaps when the Mayor, when he wishes to get the best information on that subject that has been troubling his brain, may come here and find it.

DR. GEO. H. BENJAMIN, in responding to the calls for a speech from him, said: I believe I have the honor of creating the first disturbance in the club. (Laughter) I with the other members feel a kindly interest and hope that this organization will prove a benefit to us all.

MR. RIDLON, ex-President of the Boston Electric Club, said: We, the Boston Electric Club look upon you as our parent, and we, as your children, feel all the honors and congratulate you on the success that you have had here to-night. In the organization of the Boston Electric Club, your by-laws and your constitution have been our guide, and we hope one day to invite you to the dedication of a club house in Boston which will do honor to their city and perpetuate their name to future posterity.

Informal remarks followed in happy strain by Messrs. O. E. Madden, Chas. Dutton, Col. C. M. Ransom, Dr. A. V. Garratt, Capt. W. L. Candee, Wm. Bracken and others. Mr. Bracken said: "The pleasure which has been afforded me this evening is manifold, because the majority of clubs are gotten up purely for social enjoyment, but this club has, besides the social, also the scientific and commercial elements. I must say that I have never enjoyed as much pleasure as on the present occasion in meeting so many gentlemen who are entirely in accord with the sentiments which I express in relation to an industry which is entirely novel to the majority of people at present. We are told by one of the most ingenious of French writers that the use of speech is the concealment of thought—and I am entirely unprepared to convey to you my full sentiments this evening; at the same time, I must say that I have imbibed from the President, Mr. Davis, a degree of enthusiasm for the future of this club which I am unable to express."

Solos by Lieut. Toppan, W. S. Hine, Gen. Willoughby Weston, H. W. Spang and others followed, with Mr. Geo. M. Phelps, jr., presiding at the piano in his usual artistic manner.

At a late hour "lights out" was announced by House Committee Chairman, M. W. Goodyear, and every one left in the best of feeling, realizing that the Electric Club was firmly established.

THOSE PRESENT.

Among the gentlemen present were Thos. A. Edison, C. M. Ransom, C. J. H. Woodbury, Allan V. Garratt, R. F Ross, Prof. D. M. Greene (Troy Polytechnic), Henry C. Sheafer, Geo. T. Manson, Jas. M. Mathews, H. B. Sharps, W. E. Sharps, Stephen Holbrooke, W. A. Stedelmann, H. W. Pope, Geo. F. Porter, Frank Laughlin, Louis W. Burnham, David E. Drake, Willard L Candee, Chas. Dutton, J. N. Keller, H D. Stanley, C O. Baker, jr., H. A. Cleverly, Frank C. Mason, M. T. Davidson, Geo. E. Voorhees, Geo. H. Lewars, H. C. Davis, W. D. Sargent, D. W. Dunn, Leonard E. Curtis, C. H. Barney, Oscar Hoftman, Geo. A. Tobey, Geo. B. Coggeshall, Geo. Worthington, C. D. Smith, E. A Colby, M Roosevelt Schuyler, Chas. A. Stevenson, Dr H. A. Bunker, F. W. Jones, Eugene T. Lynch, jr., Amanton Chace, O. E. Madden, E. W. Carritt, Geo. H. Benjamin, E. T. Copeland, Henry Van Hoevenbergh, J. C. Reilley, Geo. C. Lee, Ronald Crawford, F. A. Pickernell, D. L. Hungerford, Wm. A. Hungerford, Geo. M. McCulley, H. A Stout, James S. Spencer, Thos. L. Scovill, J. C. Dalton, E. N. Dickerson, C. W. Gould, E. N. Dickerson, jr., Francis A. Wall, Chas. N. Judson, J. R. Wallace, Francis R. Upton Capt. E. L. Zalinski, U. S. A., Gen'l John Newton, Sam'l M. Bryan, Geo S. Ladd Edwin Atwell, Mayor Abram S. Hewitt, James Kempster, E. J. Mathews, William Bracken, General W. Weston, Albert T. Heward. R. G. Angell, A. S. Hibbard, M. W. Goodyear, Frank L. Bigelow, George S Barnum, W. B. Vansize, W. M. Clark, Charles W. Lippitt, M. M. Garver, Jno Stanton, J. Wheeler Hardley, Wallace S. Clark, Harry H. Sawyer, Frederick Reckenzaun, E. R. Knowles, W. J. Curtis, E. S. Greeley, S. A. Duncan, Loren N. Downs, Eugene F. Phillips, E. B. Baker, H. B. Lytle, R. Splaine, John J. Flanagan, Andrew J. Dam, E. L. Snell, James Beesley, Frank L. Brady, S. B. Wiggin, C. J. Field, Geo. Jones, W. W. Lyon, Jos. W. Stover, Willis Fowler, Geo. M. Phelps, jr., Geo. W. Plympton, John W. Beane, Thomas B. Doolittle, W. Harding, H. R. Garden, Alonzo T. Decker, Chas. A. Tucker, C. W. Spear, Capt. Henry Erben, U.S.N., A. H. Chadbourne. Albert Taylor, H. L. Bancroft Prof. Geo. Forbes (of England), Dr. Otto A Moses, Ed. H. Hastings, W. D. Ludlow, Nelson M Beach, Friend W. Smith, Thos. L. Fowler, F G. Stone, J A. Corby, Simeon J. Fox, H. W Spang, H. L. Lufkin, C. W. Buchholtz, John Rooney, Hon. John C. New, Gen. Daniel Macauley, D. H. Bates, Hermann Hollerith, T. P. McElrath, Dr. Francis Wyatt, L. J. B Lincoln, J F. Kelley, Chas. J. Kintner, S K Dingle, F. Gottschalk, C E Perring, H. T. Edwards, J C. Chamberlain, H. D. Hall, John W. Handrem, W. M. Callender, Amos Broadnax, H.C. Adams, Arthur D. Newton, Henry Hine, W. S. Hine, Thos. J. McTighe, J. G. Noyes, S. S. Wheeler, N. T. Pulsifer, Capt. A. P. Cooke, U. S N. W. W. Richards, Prof. Wm A. Anthony, Chas. F. Cutler, James W. Godfrey, L. H. Mudgett, Wm. Marshall, Theo. Larbig, Frank Ridlon, A. J. De Camp, J. A. Seeley, Col. John Jameson, Thomas P. Conant, E. J Hall, jr., Col. Chas. H. Banes, H. M Reynolds. J. C. Allen. Lieut. F. W. Toppan, U. S. N., E. T. Gilliland, Col. Albon Man, E. F. Peck, Jno C Tomlinson, Prof. H. A. Rowland, John M. Robertson.

GENERAL CLUB NOTES.

Every room is furnisLed with two wall switches, each controlling half the lights in the electroliers—a great convenience in every way.

Electric push buttons everywhere, and for every probable need, were donated by Messrs. Hazazer & Stanley.

Electric clocks that are self-winding, and needing no key or attention, set off many of the rooms.

Electric boot-blacking apparatus surprised guests and made them forget there ever was such a phrase as "tempus fugit." This was presented the club by the Edgerton Motor Company.

Electric broilers rendered *sauce piquante* unnecessary on the juicy steaks and chops browned thereon. This was the Burton heater, kindly sent the club by Mr. E. H. Johnson.

A safe with electric combination lock will defy the bold burglar, if he ever gets past the faithful Geni of the front portal, and is the invention of Mr. Chas. Kintner.

An electric piano is on the way, and in this also electricity will be the Geni whose invisible fingers will flash over the keys and charm the ears of the club with sublime strains.

Bergmann & Co. furnished the outside lantern, the front hall fixtures, and those in the assembly room, and the Edison lamps used with them were presented the club by the United Edison Company.

Thackara, Buck & Co., of Philadelphia, made most generous concessions in prices on their very elegant fixtures, which adorn the parlors, dining rooms, library, etc.

The beautiful cut glass globes on the large parlor electroliers were the gift of Mr. A. H. Patterson, the enterprising New York manager of the Phœnix Glass Co., of Pittsburgh, and their beautiful effect attracted every one's attention. This was a very handsome and considerate gift.

The Okonite Company donated their wire, which was extensively and almost exclusively used in the installation. Some wire was also donated by the N. Y. Insulated Wire Co., and was put to excellent use.

The Consolidated Electric Light Company, (Sawyer-Man) was most generous contributing a great number of the lamps, switches, cut-outs, etc., and the 200 light Thomson-Houston dynamo, as well as bearing the heaviest burden of getting the work done.

The specially constructed 250 light machine is the gift of the United States Electric Lighting Company, as well as all lamps of their make used on the premises.

The Electrical Accumulator Company have "stored up" the thanks of all members in advance, by their munificent donation of the great storage plant described.

In the conclusion of the letter from the White House, Private Secretary Lamont said: "The President appreciates the courtesy shown him, and expresses the hope that the occasion may foreshadow the club's success, and abundant good results follow its efforts."

To a quiet observer, the best thing of the evening was the play of emotions on President Davis' face, when the genuine surprise came upon him. He was totally ignorant of what was coming, and as Mr. Tomlinson developed his story, the president *watched* the casket, wonder expressed in every lineament as to the mysterious contents. And when finally the speaker took pity and displayed the contents, Mr. Davis' face beamed with pleasure and unconcealed gratification; not, as he very truly said, because of its pecuniary value, but because its very pecuniary value represented, in the most powerful form, something any man alive would be proud of—the affectionate esteem and appreciation of such an association. Though it was a non-magnetic watch, it was full of magnetism for him; it was a loadstone which would ever exert a kindly attraction on his heart, and draw it towards the club. He now had something he could preserve and "hand down as an heirloom" of his own when his life's work was done. Capt. W. L. Candee was the me mover in arranging for the gift.

RAWORTH'S GALVANOMETER.

The Edison Illuminating Company donate the free use of current from their uptown station to any required extent, as soon as they get in operation. This will still further increase the lighting capacity of the house, and will assure electric current under all contingencies.

The Metropolitan Telephone and Telegraph Company grant the free use of the telephone placed in the closet in the main hallway.

The American Telephone and Telegraph Company contribute the beautiful cabinet set and long distance transmitter in the officers' room, and the free use thereof for talking between Philadelphia, New York, Albany, Boston and other points, for a period of ten days from the 29th. This was a very thoughtful act, and one greatly appreciated.

Mr. O. E. Madden made a charming toastmaster, as occasion demanded, during the evening, and the eloquent sweep of his strong left arm could ever command silence His kindly remarks on the success of the Electric Club were cheered to the echo. He compelled some gentlemen to deliver speeches who had never done so before and who say they never will again.

A large number of kindly letters and telegrams were received, but only a few could be read, in the few minutes all wed. W. J. Denuer, vice-president of the Boston Electric Club, sent greeting and best wishes. Prof. Elihu Thomson, of Lynn, Mass., sent hearty congratulations and sincere wishes for the club's future prosperity. Gen. Sheridan's name was applauded, as were several of the other names, when his courteous letter was read. The editor of *Invention*, London, wished the club every success, and was "sure that it would prove an important factor in the development of electrical science in the States."

General Manufacturing Notes.

The insulated wire manufacturing house of Alfred F. Moore, Philadelphia, which continues to maintain its fine reputation for quality of goods produced, has recently added to it Mr. Chas. C. King and Mr. Antoine Bournonville, the firm name remaining as heretofore.

The Ansonia Brass and Copper Company, New York, is in receipt of a number of recent strong letters, endorsing their patent fire-proof and weather-proof wire. These letters state that the claims of the company, that the wire possesses high insulation, is fire-proof and weather proof, are well sustained. Prof. Henry Morton made an elaborate test, and writes a letter, commending these qualities in this wire The Ansonia people are now pushing this wire into the electric lighting field with much success. The wire market is quite active just at present.

The Bridgeport Brass Company is still happy over the influx of orders. In the electric light field no company has a larger constituency or a more wide-awake representative—H. D. Stanley—than the Bridgeport Brass Company.

Since the reduction of the cost of obtaining English patents, beginning with 1884, the number of applications has gradually increased, as shown by the following table:

1884	Applications filed	....	17,110
1885	"	"	16,101
1886	"	"	17,162
1887	"	"	18,029

The apparent falling off in 1885 is due to the fact that a great many intending applicants in the fall of 1883 held off till the new law went into effect in January, 1884, and the record of 1884 is therefore abnormal.

General Business and Personal Notes.

Mr. C. D. Crandall, for the past six years secretary and treasurer of the Missouri & Kansas Telephone Co., Kansas City, has decided to sever his connection with the company, and accept a responsible position with the Western Electric Company. Mr. Crandall is a capable, careful, and always reliable electrical worker, and the REVIEW extends its most cordial well wishes for his continued success in the Garden City. Mr. J. W. Ebert, formerly manager of the Kansas City Telephone Exchange, accompanies Mr. Crandall to his Chicago field of labor.

W. Stanley, jr., the active and original worker in electrical science, takes a trip to Florida this week, for rest, recuperation and robustness.

Hon. George R. Peck, of Topeka, Kansas, the able head of the legal department of that great corporation, the Atchison, Topeka & Santa Fe Railway Company, was a New York visitor last week, accompanied by Vice-President C. W. Smith, of the same company. Mr. Peck is a former telephone stockholder, and always takes great interest in electrical enterprises. A few years ago—Mr. Peck is still a young man—before his abilities were so fully appreciated, Mr. Peck received the appointment of attorney for the Western Union in an important case, through Mr. Norman Williams, of Chicago, then, as now, the Western attorney for that great telegraph corporation. Mr. Peck acquitted himself with highest honors, and Mr. Williams not only had the satisfaction of having the wisdom of his choice proven, but in a short time received a substantial return. The Santa Fe road decided to build to Chicago some eighteen months ago, and it became necessary to have able legal talent in that city, and Mr. Peck promptly gave Mr. Williams the appointment. Honors are now easy between these two eminent attorneys.

Mr. Charles Dustin, general manager of the Schuyler Electric Company, was in the city last week. His company's new factory at Middletown, Conn., opens up this week, and will at once commence turning out apparatus.

Hon. George W. Cooly, alderman of Minneapolis, has been a New York visitor for several days past, investigating electric railway systems. Mr. Cooly is one of the energetic citizens of Minneapolis, and believes in keeping well informed on all the improvements electricity is making in this part of the country.

Messrs. Holmes, Booth & Haydens, who are never behindhand to meet the requirements of their trade, have placed upon the market their well-known "K. K." insulated wire. This is an old wire put to a new purpose, and, as every electrical man knows, a time-test is necessary to find out the merits of line wire, Messrs. Holmes, Booth & Haydens, after having "K. K." wire in use for a period of nearly eight years, recommend it with confidence for its highly waterproof qualities and fitness for withstanding abrasion, etc. Since placing this wire before the electric light trade, the entire line construction in three cities has been done with this wire. The demand for this wire on alternating work is also large. Mr. J. L. Barclay, their Western representative, reports large sales of "K. K."

Mr. Clark B. Hotchkiss, with his usual energy, is securing a great trade in his widely-known "Kerite" wires and cables. In the cable department his company is particularly busy, and possesses a strong constituency among electric light, telephone and telegraph men that the alert General Manager Hotchkiss can well be proud of.

The Electrical Supply Company, New York, claim that nine-tenths of the trouble with electric work, where batteries are used, is caused by poor batteries, and point with pride to the creditable record of their Diamond Carbon battery, which is largely used in bell work, and by the telephone companies.

Raworth's Lineman's Galvanometer.

The galvanometer we illustrate has been designed for use in laying and testing electric light mains and telegraph wires. While bearing a general external resemblance to the instrument at present in vogue, the new galvanometer goes far beyond it in usefulness, and serves an extended variety of purposes beyond merely indicating the passage of a current. It contains, besides the deflecting coils and the needle, a battery of two or four cells, and a bobbin of fine wire wound to a resistance of 600 ohms. On the exterior of the case there are four terminals marked *A*, *B*, *C*, and *D*, of which, however, only *A*, *B*, and *D* are visible in the engravings. *A* and *B* form the terminals of the battery, *D* and *C* the terminals of the resistance coil, while the galvanometer coils are interposed between *B* and *D*. It is, therefore, evident that if *A* and *C* be joined by a short piece of wire the instrument will be short-circuited, and the current will flow through the battery, the galvanometer, and the resistance coil. This will give a deflection of the needle of a certain number of degrees, and as long as the battery is in good working order this deflection will always be the same; thus, the operator can always assure himself before commencing work that his instrument is in good condition.

If the terminals *A* and *D* be connected to an external circuit, then the current flows from the battery through the galvanometer and back through the external circuit to the battery. Under these conditions the resistance of the external circuit can be found by noting the deflection and comparing it with a table found on the inside of the lid of the box. The following is a very abbreviated example of such a table:

Ohms.	Deflection. deg.
10,000	3
5,000	7
2,000	17
1,000	27
500	39
100	56

Thus the instrument is directly available for testing resistances.

The terminals *A* and *B* are the poles of the battery, and when connection is made to these alone the galvanometer is out of circuit.

The face of the instrument is protected by a hinged cover. This bears on its inner side a mirror, the usefulness of which will be immediately recognized by all who have much experience of testing work, as it enables the needle to be watched from a distance, and without the inconvenient stooping which might otherwise be necessary. The mirror may also be employed to direct a light on to the needle when working in confined situations.

This instrument, which appears to combine in itself all the appliances required for line work, is the invention of Mr. J. S. Raworth, the superintending engineer of the Anglo-American Brush Company, and is manufactured by Messrs. Dorman & Smith, Brazenose street, Manchester.—*Engineering.*

Electro-Plating Dynamos.

The use of the dynamo for electric plating has not only materially lessened the labor and the cost of electro-plating, but the ease and certainty with which it is operated have enabled a great many of miscellaneous establishments to add to their manufacturing operations a plant for finishing their wares by electro-plating. By simplifying and cheapening the operation of electro-deposition, the introduction of the dynamo may be said substantially to have made the industry of electro-plating with nickel a commercial possibility, for, although methods for depositing this metal had been known long prior to the invention of the plating machine, the cost and difficulty of securing uniformly satisfactory work by depositing this metal with the battery were so considerable, that the introduction of the art on the commercial scale was never seriously attempted. Yet, to-day it is one of the most widely practiced branches of this beautiful art, which adds to the beauty and durability of multitudes of objects of every-day use. It is safe to affirm that, in the United States at least, no electro-plating establishment worthy of the name exists, in which the old method of plating has not been abandoned to make way for the new; while, at the same time, it has added vastly to the commercial importance of the business.

The dynamo-electric machines illustrated in this issue are manufactured by Messrs. Hanson, Van Winkle & Co., of Newark, N. J., an establishment that is most widely and favorably known as turning out splendid apparatus. Two machines are shown, for

FIG. 1.—HANSON, VAN WINKLE & CO.'S ELECTRO-PLATING DYNAMO.

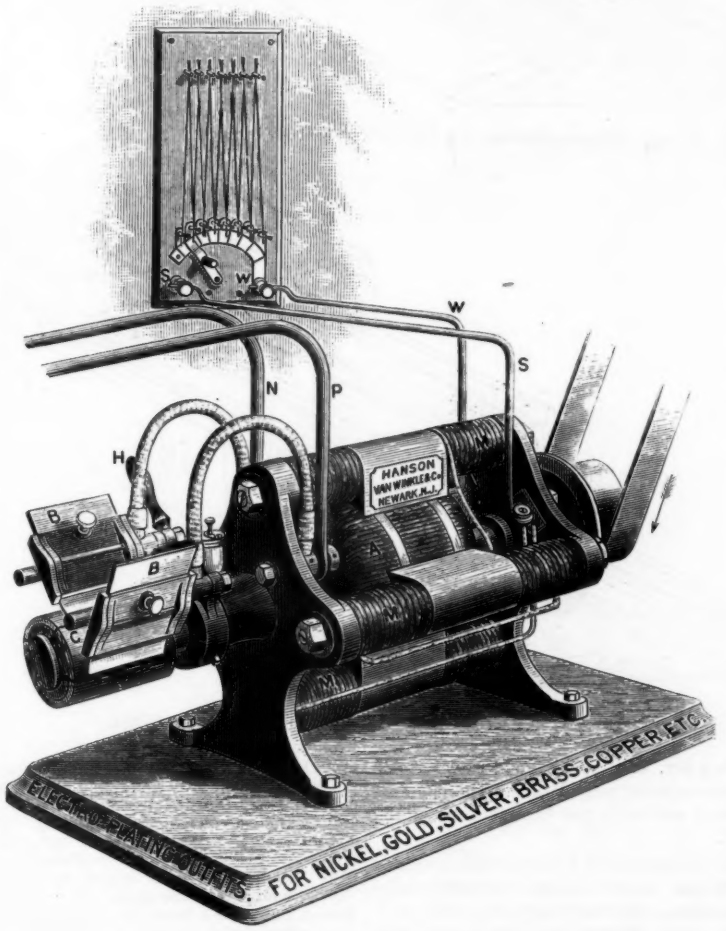

FIG. 2.—ELECTRO-PLATING DYNAMO FOR LARGE WORK.

large and small work, and represent the most approved construction resulting from years of experiment and careful work. These machines are in great demand, and are admirably constructed, both for efficiency and convenience of adjustment. It may be taken as an excellent guarantee of the excellence of the work that the manufacturers signify their willingness to place the machines subject to approval. This branch of the business where dynamos are used is rapidly growing, and Messrs. Hanson, Van Winkle & Co. have done a great deal in bringing it to its present strong position.

—— When the Chicago Arc Light and Power Company moved into the present location, it was deemed best to put the lines from the dynamos to the street conduit manhole at the corner of Market and Washington, in a wooden box, instead of either iron or Dorsett conduit. It didn't cost much to make the experiment—that is, not then. The other day, by some means or other, there was an arc formed in the box, and for a couple of days or so, according to one of the Chicago journals, there was no extinguishing the blaze. Finally a still alarm to the chemical engine in the neighborhood brought out one of the soda squirts, when the fire in the economical box was extinguished.

—— The Swan Lamp Manufacturing Company is an adjunct to the Brush Electric Company, of Cleveland. Officers and directors of the Swan Lamp Manufacturing Company were elected last week at the office of the company on Belden street, as follows: President, Myron T. Herrick; vice-president, James M. Hoyt; secretary and treasurer, Samuel E. Cox; superintendent, E. B. Nicolaus; directors, C. F. Brush, James J. Tracy, General M. D. Leggett, Myron T. Herrick, and J. M. Hoyt.

ELECTRIC LIGHT NEWS

—— The Little Rock (Ark.) electric railway will be running early in the spring.

—— The Owosso Edison Electric Light and Motor Power Company will erect a plant at Owosso, Mich.

—— The Thomson-Houston Electric Light Company will erect a building for its plant at Buffalo, N. Y. Cost, $40,000.

—— The electric light company at Westerly R. I., is meeting with popular favor, and ten city lights have been contracted for.

—— The Electric Cutting Machine Company, Chicago, Ill., has been organized with a capital stock of $500,000. Frank W. Nevins, and others, incorporators.

—— The Raleigh Lighting, Heating and Power Company, Raleigh, N. C., has been incorporated. Capital stock, $25,000. George J. Morse, and others, incorporators.

—— The Harrisburgh Electric Light Company, Harrisburgh, Pa., has increased its capital stock from $100,000 to $150,000, and will make extensive improvements to its plant.

—— The insurance electric light rules which were recently issued from the Phœnix Fire office, London, were quite largely drawn from those promulgated some time ago by Dr. Geo. H. Benjamin, of this city.

—— The city of Lewiston, Maine, some months ago decided to do its own street lighting. The award was granted to the American Company. The plant has just been completed, and the mayor reports that it is giving perfect satisfaction.

—— January 1, the Brush-Swan Electric Light and Power Company consolidated with the Binghamton, N. Y., Gas Light Company, with a capital of $300,000. It is proposed to increase the capacity of both the electric and gas plants to meet the requirements of the rapidly growing city of Binghamton.

—— The Brush Electric Light and Power Company of Topeka Kas., has offered to furnish the city with 120 arc lights, to run eight hours a night for $10 each, for one month, or to run all night for $12 a month. Mr. Webb, of the Jenney Electric Light Company of Indianapolis, proposes to furnish the city with an electric light plant complete, set up and lighted for $21,700. Mr. C. O. Steele, of the Brush Electric Light Company, has offered to erect an electric light plant, and furnish 120 arc lights for $18,487. The Thomson-Houston Electric Light Company offered to furnish a complete plant for $22,500, and invited the council and city officials to visit and inspect the plant in Kansas City, Mo., which invitation was accepted. Mr. Reilly, of the Schuyler Electric Light Company, has also made a proposition to light the city, or to furnish an electric light and steam plant. The council wants to know if any electric light company got away.

—— Electric lighting *vs.* gas lighting was brought under discussion at a recent meeting of the Manchester Association of Engineers, when Mr. J. R. Williamson read a paper on electric lighting from central stations; and in reply to some questions which were raised as to the results obtained in the application of electric lighting to mills and works, and the comparative cost of gas and electricity, Mr. Williamson replied that in the immediate vicinity of Manchester there were a score or more mills where the electric light was working successfully, and as to the comparative cost of gas and electricity, he pointed out that in one large mill, where lighting by gas had been replaced by 930 electric lamps, the cost over a certain period had been £362 for maintaining the electric lamps, as compared with £510 which had previously been paid for gas at the rate of 3s. 2d. per 1,000 feet.

Telephonic News

*** The telephone exchange at Kansas City has 2,300 subscribers, 630 new ones coming in during the last year.

*** The telephone field loses a valuable man from its active circles in the departure of Mr. C. D. Crandall from the M. & K.

*** The National Telephone Company of Scotland has several submarine cables of seven, eight and nine miles in length, which give perfect satisfaction.

*** The net output of telephones by the American Bell Telephone Company for January, 1888, was 2,358, against 2,018 in the same month last year, an increase of 340.

*** At a meeting of the directors of the New England Telephone and Telegraph Company held January 25, a dividend of one dollar and twenty-five cents per share was declared, payable on Wednesday, February 15, 1888, to stockholders of record at the close of business on Tuesday, January 31, 1888. The transfer books will be closed from February 1, 1888, to February 14, 1888, both days included. Statement of business for the last three months will be sent out as soon as completed.

*** The Chicago Telephone Company held an election the other day, and the following directors were duly created: John Crerar, John DeKoven, John B. Drake, J. Russell Jones, C. E. Perkins, George L. Phillips, Howard Stockton, John L. Thompson, and Norman Williams. The only change in the board from last year was the substitution of Gen. Thompson's name for that of ex-manager Fay. President Phillips said the company was doing all it could to meet the complaints of its patrons. At the meeting of the directors soon to be held, the trouble with the city will be discussed and some line of policy adopted.

*** Some interesting experiments have lately been made to test the feasibility of enabling ships to communicate with one another by means of what may be called a sea telphone It is known that water is a good transmitter of sound, and that the velocity with which sound is conveyed through it is about four times as great as its velocity through the air.

Experiments made on the Lake of Geneva long ago showed that the sound of a submerged bell could be heard by means of a special form of ear trumpet, also placed beneath the water, at a distance of several miles from the bell.

Mr. Boyer, of H.M.S. Malabar, has lately revived this experiment, only he has used a telephone instead of an ear trumpet as receiver of the sounds transmitted.

The apparatus consists of a large flat bell or gong placed just below the water line at a ship's side, and which is so connected by means of a tube with the deck that a hammer can be made to act on the bell at will. This is the transmitter. The receiver consists of a Bell telephone, with a large diaphragm placed in the center of the bell, and connected by means of wires with another telephone on the deck of the ship. This second instrument is held to the observer's ear.

By means of this apparatus it is found that sound can be readily conveyed through the water for upward of a mile, and it is claimed that signals can thus be made under the sea which will be quite independent of fog or stormy weather.

There seems to us to be only one weak point in this method of signaling, and that is the want of a means of calling the attention of the distant receiver when the transmitter wishes to send a signal. In the working of the ordinary telephone each observer has his signaling bell, but this is impossible with the sea telephone. In the absence of fog, too, the ordinary system of signaling, either by means of flags, or at night by flashing lights, apparently meets all requirements.

Creosoted Wood for Underground Work.

The interest in the work of burying electric wires continues to grow, and electric companies are investigating all the projects that are presented. There are a great many questions to be considered in connection with this work, and no company can afford to be hasty in deciding which is the best system as regards the three essentials of efficiency, expense and durability. The Macdonald subway electrical conduit, owned by the Eppinger & Russell Creosoting Works, of which Mr. Geo. S. Valentine is manager, is described below. In this, the wood of which the conduit is made is treated with dead oil of coal tar or other preservative fluids, and the conduits are either square or round, and are of any size desired. The conduits can be increased indefinitely, simply by adding the center pieces, as shown in Fig. 2. It is claimed by the company that four men can easily lay a mile a day, and the wires and cables can be taken out at any point desired. The joints are broken and when put together form a solid box.

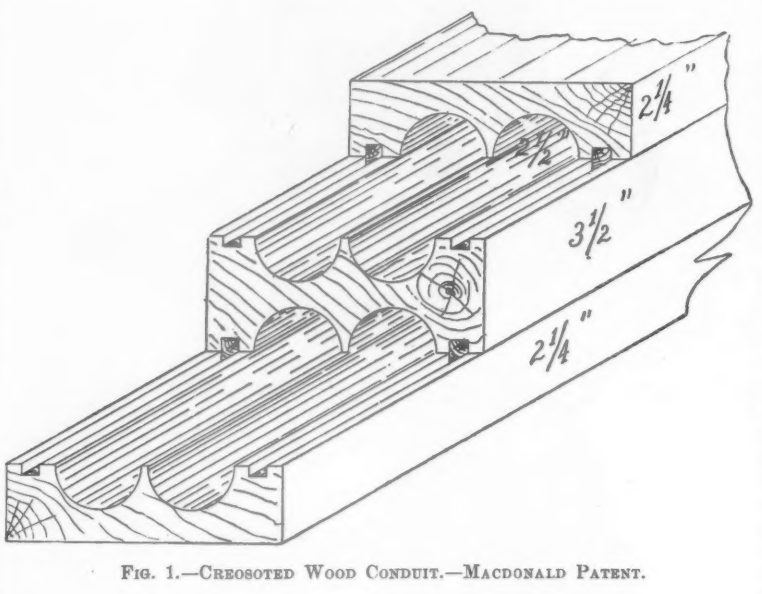

Fig. 1.—Creosoted Wood Conduit.—Macdonald Patent.

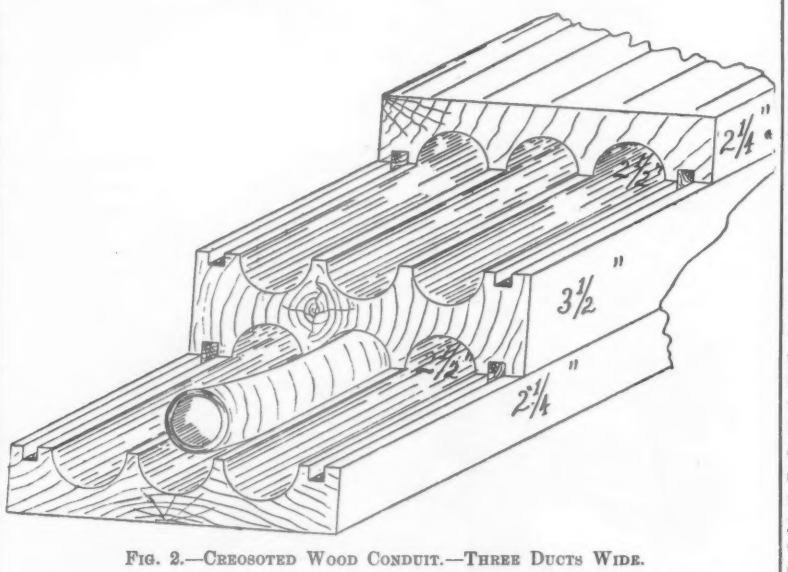

Fig. 2.—Creosoted Wood Conduit.—Three Ducts Wide.

It is a remarkable fact that timber treated with dead oil of coal tar, commonly called creosoting, has been in use since 1838, and is still sound. Timber properly treated with the above oil is said to be practically indestructible as regards decay.

Prof. Plympton, of the Brooklyn subway commission, when in England a short time ago, was shown specimens of this timber that had been in use for over thirty years, and was perfectly sound. Large amounts of creosoted lumber have been furnished by the Eppinger & Russell Creosoting Works, for underground work, for the New York and New Jersey Telephone Co., Brooklyn; D. R. Walker, chief of electrical bureau, Philadelphia; American Telephone and Telegraph Co., Philadelphia and New York; Bell Telephone Co., Buffalo; N. E. Telephone Co., Boston; Edison Electric Light Co., New York, Boston, Mass., Columbus, O., and Schenectady, N. Y.; Chicago Telephone Co., Chicago; Phœnix Construction Co., New York, and many others; all of which, we are informed, are giving full satisfaction.

The company has recently issued an interesting descriptive circular, and our electrical readers, who are at all interested in the matter of underground wires, should write General Manager Valentine (160 Water street, New York,) for this pamphlet, which gives full instructions for laying the conduit.

How Would this Method Answer for the Electric Club?

"Causerie," in the Boston *Herald*, presents the following unique method of club members:

The reference made recently to Mr. Emerson's statement of the qualifications necessary for membership in the Saturday Club was brought up in the smoking compartment of the parlor car the other day, and turned the conversation toward club matters in general, and methods of election in particular. The advantages and disadvantages of the several methods—by the club, by a committee—were fully discussed, and at length George M. Towle, who was of the party, said: "In the Round Table the scheme is simplicity itself. At a dinner the president announces the name of the candidate. If it is received in silence, he is a member from that moment, but if any one says 'Oh, h—l!' there is no election."

*** The city of New Orleans, by an ordinance, imposed an annual charge of $5 00 per pole upon the poles of a telephone company already established, as a "consideration for the privilege." The Supreme Court of Louisiana lately held, in the case of The City of New Orleans vs. The Great Southern Telephone and Telegraph Company, that this provision constituted neither a tax on property nor a license, and that it could not be sustained either under the taxing power or the police power.

Dr. Green, of the Western Union, Speaks in Opposition to a Postal Telegraph.

Dr. Norvin Green, president of the Western Union Telegraph Company, addressed the Senate Post-Office Committee in opposition to the Governmental Telegraph bills. He devoted himself first, though briefly, to the constitutional questions to which the measure had given rise No people on earth, he then maintained, enjoyed so perfect a system of telegraph as Americans, as any person who had had experience with telegraphs abroad would testify. He read a letter from Joseph McLean, agent of the Associated Press in London, to his employers, which was as follows:

"The telegraphic communication between France and England is disgracefully bad. It is an actual fact that London merchants send their messages to Havre by way of New York, and they reach Havre quicker than if they were sent from London to Havre direct."

This fact, Dr. Green said, was corroborated by knowledge which came to the company through the transaction of its own business. He showed that the English rate of 12 cents for twelve words, including date, address and signature, would, in a very large number of cases, if it should be applied to messages sent in the United States, amount to more than the current 25 cent rate charged by his company, the address and signature in English messages being very much shorter as a rule.

It had been insisted, Dr. Green said, that the Western Union Telegraph Company is a monopoly. What, he asked, is a monopoly? The Western Union had no exclusive franchises or legislative grants. The elementary patents of the telegraph had expired, and the field was open to anybody who might choose to enter it. The Western Union was no more a monopoly than any great commercial business. It had come to be a maxim in commerce that the aggregation of capital in large enterprises cheapens production, and therefore tends to the public welfare. It was this aggregation which had enabled the Western Union to reduce its rates, as he would show by tables which he would submit, to less than one-half the average cost to the company of doing the business nineteen years ago. The old rates looked very absurd at this day, but if one should go to Europe and undertake to send a message across the Continent he would find very much similar rates prevailing there at this time.

In 1867 the cost of handling messages averaged 63.4 cents, and the rate to the public was 104.7. The public rates had been reduced until in 1882 the rates to the public were 38.2 cents, while the cost to the company was 38.8 cents, and last year the rates to the public were 30.4 cents, while the cost to the company was 23 cents. Now, it might be asked, would that rate not be increased during the present year. To this he answered unhesitatingly, no; the rate would be reduced to the public during the present year. A great deal had been said about increase of rates. The Western Union had increased its rates in only two or three instances. The rates of the Mutual Union had been increased, and the Baltimore and Ohio rates had been abolished when that company had been taken over. The Baltimore and Ohio had begun its competition by a war of rates. It could be well established that that company was projected and built to be sold to the Western Union as a speculation. That was expected to be accomplished on the basis of the damage it could do to the Western Union, and not on the basis of actual value. Competition in any business, by war of rates, he said, is ruinous to the weaker parties. Not wishing to allow its business to be influenced or its rates to be dictated by a company which could not do one-tenth the business, the Western Union had not reduced its rates, but had reduced the rates of the Mutual Union to meet those of the Baltimore and Ohio.

The matter of rates, Dr. Green maintained, was of far less consequence to the public than the question of time. The Baltimore and Ohio, with its low rates, had done a business during last year of $1,326,000

against over $15,000,000 done by the Western Union, notwithstanding the higher rates of the latter, the Baltimore and Ohio covering nearly all the paying territory of the country. The history of Government telegraphs was noted only for tardy and blundering service, and especially had Government systems been indifferent to prompt deliveries. They deliver at their leisure. The French Commissioner General of Telegraphs once said to his (Dr. Green's) predecessor: "You make one grand mistake. You zinks zee telegraph is made for zee people. We zinks zee people is made for zee telegraph." It was not reasonable to hope or expect that the Government would be more watchful or vigilant in keeping every employe down to his work than men who were immediately interested in the profits of the company. The doctrine of the Western Union was that its greatest competitor is time; and just as far as it could overcome time could it increase its revenues. It was this which had compelled it to build 34,000 miles of line last year, not including the purchase of the Baltimore and Ohio.

The First Public Trial of the Electric Telegraph.

Back in the winter of 1843-4 Mr. John W. Kirk was taken from Ohio to Washington to look after bids that he and business associates had made to carry the mails over stage routes to the West—as the towns of Pittsburgh, Wheeling, and Cleveland were then described. His business was not the task of a single day; it had months of waiting in it, and Mr. Kirk settled down in the congressional presence for the season. The Post-office Department saw a good deal of him before the winter was over, says a New York *Times* correspondent. When you expect a big contract you are apt to be gracious, and if genial, young, with spare time on your hands—as Mr. Kirk's case was 44 years ago—an odd enterprise isn't likely to shock your tastes. Thus came Kirk to know Prof. Morse.

John A. Bryan, second assistant postmaster-general at that time, was one of the cleverest Ohio politicians of the day, a man of attainments in many departments of learning, but inclined to all the cautiousness of the keen political leader, and withal excitable when affairs were not to his personal liking.

"See here!" he cried one morning as Mr. Kirk entered his office. "See here! There's an abominable scheme to ruin me—ruin me, sir!" The gentleman's language was a little more ornamental, as he proceeded to make clear to his friendly caller that superior officers had plotted to sacrifice him by putting in his hands the duty of handling the thirty-thousand-dollar appropriation which Congress, in its haste to adjourn at a previous session, had voted for electric experiments by Morse. "To be identified with such foolishness," declared this officer, was to commit "political suicide," for of course the end of the whole business would be that Morse would be recognized as crazy, and men consorting with him would be looked upon with suspicion, as, the assistant postmaster-general seemed to think, they deserved to be. "You must help me out of the scrape," he said to Mr. Kirk. "I want you to undertake the duty of looking after Morse. If he puts up wires you see that it's all right and I'll pay the bills—only, you see I really can't afford to have any closer connection with the thing."

Morse had possessed himself of a little room in the east end of the Capitol, and there, abstracted but active, the new attaché of the Pos-office Department found him, a thin, spare, careworn, anxious man, in the midst of confusing heaps of wire and pots and apparent debris. The worker paid little heed to his visitor. He was on the eve of a test whereby he hoped to satisfy official doubters. A congressional committee was on its way to see him and examine in practical operation the machine which he had promised would transmit intelligent messages between points miles apart. The line which, started toward Baltimore, was built, about five miles without the Washington limits, and the "metallic circuit" (before the day of ground wires) was in working order. The committee came. The inventor was in high spirit. Enthusiasm made him almost a young man again. The time was arrived, he felt, for a signal victory. No longer would anybody question his claims. Now for proof not to be gainsaid. The statesmen approached his instrument cautiously, as if suspecting that it might suddenly get into an exploding fit. They lifted their feet high and swiftly over stray lines of wire crossing the floor, fearful of shocks. Their skeptical countenances would have driven the original doubting Thomas wild with envy. But finally they arranged themselves as closely as they dared beside the animated electrician and awaited his experiments.

"Now, gentlemen, what shall we send over the wire?" ejaculated the old man.

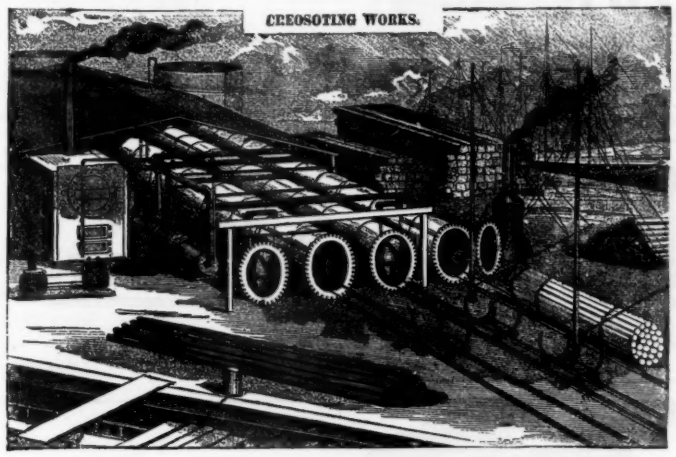

FIG. 4.—EPPINGER & RUSSELL'S CREOSOTING WORKS.

"Pick out your own message and I'll show you how simple this whole thing is and how it accomplishes everything that I've claimed."

The gentlemen were hardly expecting a challenge like this, but finally congressional genius asserted itself, and one of the party proposed that this startlingly original informa ion be flashed along:

"Mr. Brown, of Indiana, is here."

Prof. Morse bent over his instrument and pegged away. Tick, tick, tick-tick tick went the electric tapping, and then a moment later came the same rattling line of signals upon an adjoining machine—the indentation Morse register.

The old man grabbed the slip of paper as it came released from the instrument, scanned it eagerly, and then, with the air of an emperor whose crown is self-won, he thrust the fluttering white scrap forward. What to the congressmen appeared a confused collection of unintelligible dots and dashes stretched along the paper. It was the telegraphic alphabet, explained the enthusiast.

"See!" and he displayed another sheet on which his dot and dash sign manual appeared—"See! Take this for a guide and you'll find printed there the very words you asked transmitted."

The delegation did as directed, and sure enough they spelled out the sensational goings on of "Mr. Brown, of Indiana."

Converted? Those congressmen converted? Well, hardly. This is the recollection of Mr. Kirk: "One of them hunched me and winked in a superior and knowing sort of way, while another whispered: 'That's what I call pretty thin!' and a third remarked right out loud: 'It won't do! That doesn't prove anything.' Poor Morse's heart was almost broken. His triumph was turned all to bitterness. Every one of his visitors went away more skeptical than ever. The public, or so small a portion as took any interest in the matter, generally attributed the results that Morse obtained to diabolism, or (when the more intelligent and scientific minds considered it) to mere legerdemain.

"Everybody," continued Mr. Kirk, "thought it a good joke on me, and I had to stand lots of chaffing around the Capitol. It wasn't long before I saw that Assistant Postmaster general Bryan had a pretty level head as a politician in not wanting to be mixed up with what he called 'Morse's foolishness.' But I held on. The truth is, I had fallen in love with that resolute old man battling against such odds as prejudice kept piling up against him."

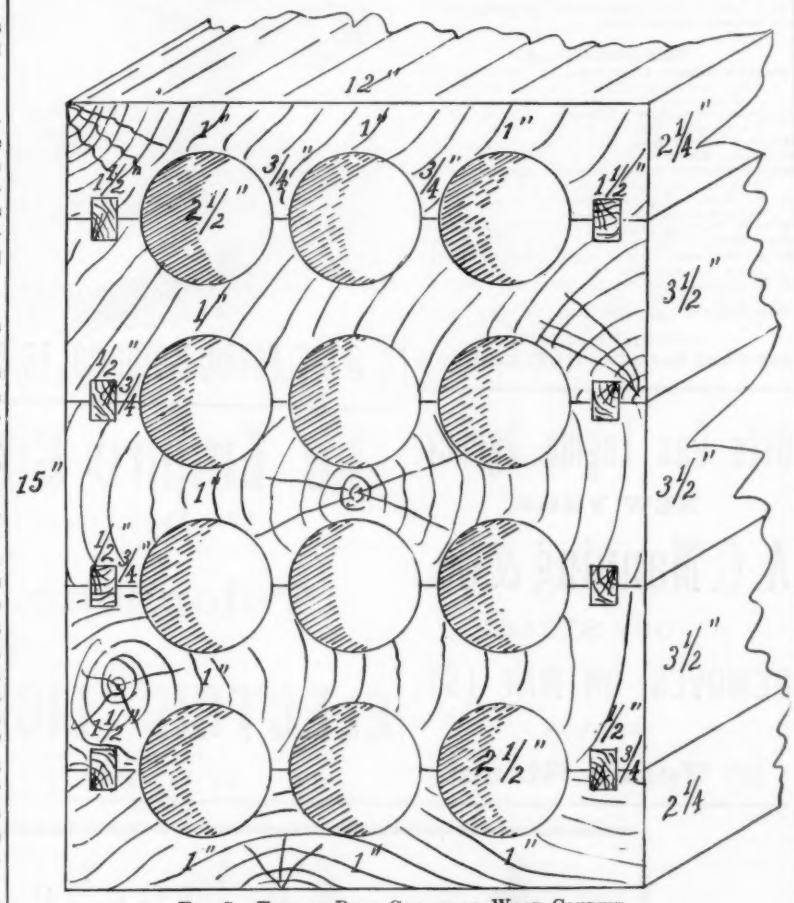

FIG. 5.—TWELVE-DUCT CREOSOTED WOOD CONDUIT.

TELEGRAPHIC

.... A twenty mile electric railway system is to be constructed from Detroit, Mich., to a fashionable resort. There will be three motors, and $20,000 worth of half-inch copper wire conductors will be used. There will be three closed cars for winter and three open ones for summer.

.... Supt. Dickey, of the Western Union, and Supt. Korty, of the Union Pacific Telegraph, with H. E. Jennison, superintendent of telegraph construction of the Union Pacific, are looking after telegraph business in Montana and Idaho. The Union Pacific is building a new line from Nampa to Boise, Idaho, and Mr. Jennison goes to inspect the work.

....The committee of the city government on electric wires gave a hearing on Thursday on the petition of Henry E Cobb and others who ask for a transfer of the rights granted to the American Conduit and Construction Company, to lay conduits in the streets of Boston. The committee consists of Aldermen Kelley and N. G. Smith. The other gentlemen associated with Mr. Cobb, who is a member of the firm of bankers, Brewster, Cobb, and Esterbrook, are R. M. Pulsifer, proprietor of the Boston *Herald*, and A. H. Chapman, superintendent of the private lines department of the New England Telephone Company, and a prominent member of the Electric Club. The petitioners were represented by Mr. S. L. Powers, who asked that the exclusive franchise be given them, in consideration of the expenditure involved and their high standing, which insures a faithful and honorable carrying on of the business. The hearing was adjourned, after the views of the petitioners had been expressed, and at the next conference Mr. Powers will present an order embodying the desires of the petitioners and specifying concerning the amount of space the new conduits would occupy in the streets. They guarantee to lay the best conduit that can be found and to allow their free use for the city wires.

....In a paper read before the Royal Meteorological Society last March, Dr. H. R. Mill calls attention to the pressing need of a thermograph which will register changes of temperature, as the instrument passes slowly from the surface to the bottom of any body of water of which the temperature is to be investigated, and, in the discussion which followed, Capt. Wilson-Barker reiterated the want. The simple problem of getting temperatures at definite depths is not an altogether easy one, but it has been solved, and the instruments now in use for this purpose are fairly satisfactory. What is needed is a continuous record, and this can probably be made only by electrical instruments.

The results of observations, as now made, have proved to be of great interest and importance. The thermometer has not only revealed many facts concerning the mutual heat transactions of air and water; it has also been converted into an instrument of hydrographical research, the most conspicuous example being the discovery by it of the Wyville-Thomson Ridge in the Faroe Channel. The thermometer can be used to warn navigators of their approach to icebergs, to land, or to certain currents, and it aids materially in tracing out the intersections of river and sea water in harbors and estuaries. Undoubtedly marine life is greatly influenced by temperature, and the thermometer may be expected to play an important part in the management of fisheries.

The inventor who would devise a satisfactory thermograph would confer a great boon on this branch of science, but the task is not an easy one. The instrument must record slight differences in temperature, but it must also be capable of registering at any depth, must be capable of withstanding the high pressure of great depths, must be indifferent to long soakings in salt or fresh water, must be capable of withstanding all the jerks and rough treatment it would get in a heavy sea, and must, at the same time, make its record accurately and instantly. It should record, with the temperature, the pressure or depth, perhaps preferably the former, as, with specific gravity and pressure, the depth could be easily deduced.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JAN. 24, 1888.

376,818 Electrical conductor; Thomas Egleston, New York, N. Y.

376,862 Means for automatically operating the gates of pneumatic tubes and similar ways; Robert M. Curtiss, Brooklyn, N. Y.

376,863 Electric cail; Willard H. Cutting, St. Louis, Mo.

376,880 Circuit closer and regulator for electro-magnetic thermoscopes; Henry J. Haight, New York, N. Y.

376,893 Underground conduit for electric wires; Ernest C. Lindemann, Baltimore, Md.

376,920 Watchman's electric controlling apparatus; Ottokar Skrivan and Francis Dvorak, Vinohrady, Prague, Bohemia, Austria-Hungary.

376,976 Electrical switch; Sigmund Bergmann, New York, N. Y., and John Thomas Dempster, Summit, N. J., assignors to Bergmann & Company New York, N. Y.

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